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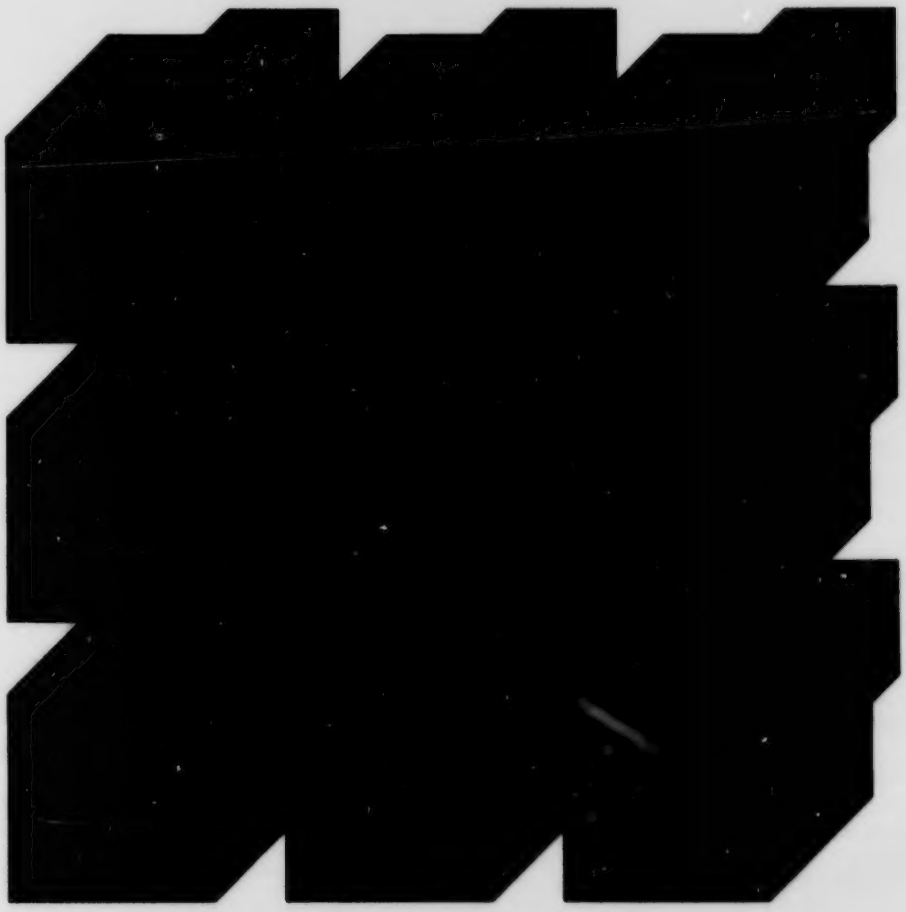

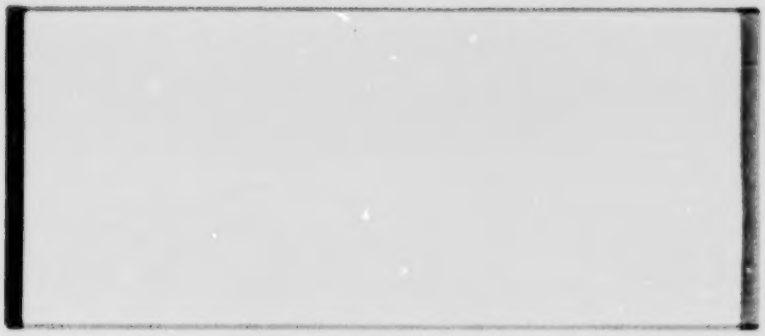

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DISCUSSION PAPER NO. 273

Farm Income Instability on the Prairies

by Jacques Jobin

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Table of Contents

	Page
Résumé	i
Abstract	iii
Acknowledgment	v
Introduction	1
Chapter 1 - INCOME INSTABILITY	3
Chapter 2 - PREVIOUS STUDIES	8
2.1 The Causes of Instability	9
2.1.1 Supply	9
2.1.1.1 Natural Causes	9
2.1.1.2 Production Cycles	10
2.1.1.3 Technological Advances	11
2.1.1.4 The International Quota System	12
2.1.1.5 Inputs	14
2.1.2 Demand	15
2.2 The Consequences of Instability	16
2.2.1 In the Farm Sector	16
2.2.2 In the Non-Farm Sector	18
2.3 Summary	23
Chapter 3 - MEASURING INSTABILITY	25
3.1 Definition and Measurement Methods	25
3.2 Selection of Variables	33
3.2.1 Farm Sector Variables	33
3.2.2 General Economic Variables	36
Chapter 4 - BEHAVIOUR OF VARIABLES	37
4.1 Some Remarks about Data	37
4.2 Behaviour of Variables	42
4.2.1 In the Farm Sector	42
4.2.2 In the Economy as a Whole	45
4.3 Instability in the Farm Sector Over Time	46

	Page
Chapter 5 - GOVERNMENT STABILIZATION PROGRAMS	49
5.1 Programs to 1945	50
5.1.1 Early 1900s (1900-30)	50
5.1.2 The Depression Years	52
5.1.3 The Secord World War	55
5.2 Programs after 1945	57
5.2.1 Federal Government Programs	58
5.2.2 Provincial Programs	65
5.2.3 Individual Stabilization Efforts	66
5.3 Summary	67
Chapter 6 - SOURCES OF INSTABILITY	68
6.1 Various Percentages	68
6.2 Observations	72
6.3 Interpretation of Results	74
Chapter 7 - ECONOMIC CONSEQUENCES - A PRELIMINARY EXAMINATION	79
Chapter 8 - EFFICACY OF PROGRAMS	83
8.1 An Ambitious Title	83
8.2 A Particular Instance: The WGSP	85
Chapter 9 - SUMMARY AND CONCLUSIONS	93
Bibliography	98
Appendixes	102

RÉSUMÉ

Cette étude mesure l'instabilité des revenus agricoles dans les Prairies par les écarts par rapport à une tendance de croissance. Les premiers résultats indiquent que la Saskatchewan subit les revenus les plus instables et que le prix du blé voit son instabilité augmenter depuis la guerre, contrairement aux autres variables agricoles choisies.

Avec l'aide d'une technique appelée l'analyse de composants, les sources de l'instabilité des revenus agricoles ont été définies comme étant, en premier lieu, les revenus provenant des ventes de céréales pour les trois quarts de l'instabilité des revenus agricoles. Deuxièmement, à l'intérieur des revenus des céréales, la production et le prix ont une contribution presque égale à l'instabilité de ces revenus. Troisièmement, pour les cultures autres que le blé, la source la plus importante d'instabilité est la superficie cultivée; pour le blé, le rendement en est la source; sauf que récemment, dans les 20 dernières années, on assiste pour le blé à un rendement stable et à des superficies cultivées très instables. Quant au bétail, les sources d'instabilité sont difficiles à circonscrire à cause de l'existence du cycle de production. Ce cycle relie prix et production de telle manière qu'avec l'analyse des composants, on ne peut affirmer que l'un ou l'autre est source de l'instabilité et dans quelle proportion.

Après avoir fait l'étude des principaux programmes de stabilisation des revenus agricoles dans l'Ouest, l'étude conclut que le prix du blé, qui est fixé par le marché international, est de loin la source unique la plus importante d'instabilité des revenus agricoles dans l'Ouest. Ce fait, combiné avec une augmentation possible de l'instabilité du rendement (comparativement aux 20 dernières années, où il fut très stable), amène les recommandations suivantes : en premier lieu, la priorité à la recherche d'un Accord International sur le prix du blé, en second lieu, la recherche et le développement de blés plus résistants combinés avec l'implantation de réseaux d'irrigation.

ABSTRACT

This study measures farm income instability on the Prairies by examining gaps that appear in the general upward trend. Preliminary results indicate that incomes in Saskatchewan are more unstable than in other provinces, and that the price of wheat has grown less stable since the Second World War, unlike the other farm variables examined.

Using a procedure known as component analysis, the sources of farm income instability were determined to be as follows. First of all, income from grain sales accounts for about three-quarters of farm income instability. Secondly, the production and price components of grain income have about an equal impact on income instability. Thirdly, for crops other than wheat, the area under crops is the most important source of instability, but for wheat the yield represents the main source of instability. Over the last 20 years, however, wheat yields have tended to be steady, while the area seeded to wheat has been more unstable. The sources of instability for cattle farming are more difficult to determine because of the production cycle, in which price and production are so closely linked that component analysis cannot establish which is responsible for instability and to what extent. After surveying the main farm income stabilization programs in western Canada, the study concludes that the price of wheat, which is fixed by the international market, is far and away the most

important cause of instability in western farm incomes. This fact, coupled with the possibility of increased yield instability (although yields have remained relatively steady in the last 20 years), prompted the study to make the following recommendations: 1) an International Agreement must be obtained on the price of wheat, and 2) research and development must be oriented toward the development of hardier strains of wheat and the undertaking of irrigation projects.

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INTRODUCTION

In the fall of 1980, the Economic Council of Canada instituted an ambitious research project on the economy of western Canada. The decision to undertake the present paper was motivated by the fact that much of the region's economy is founded on agriculture. The subject of this paper is limited to the causes and consequences of farm sector instability in the Prairie economy. This problem is not a new one, but in the past agricultural instability has been considered of secondary importance, as shown by this passage from the 1970 Report of the Federal Task Force on Agriculture, titled "Canadian Agriculture in the Seventies":

> The main problems of Canadian agriculture, as farmers see them, are two in number -- low farm incomes and uncertainty as to the future. There are other problems, of course, such as instability of prices and incomes, rising loss of credit, inability to market wheat, difficulty of finding farm labour and so on but these are secondary compared with low incomes and uncertainty. (p. 13)

Further on we find: "The problems of agriculture, as governments see them, arise largely out of the basic low farm income problem" (p. 14). As a result of sharp rises during the 1970s in sector instability and increasing pressure from farmers and consumers for remedial measures (and probably also because other problems had become less pressing), attention turned to agricultural instability.

This paper is an in-depth examination of instability in the farm sector, its causes and, to a lesser extent, its consequences. The main questions will be: who is affected, in what way, and why, and which programs are most likely to help alleviate the problems faced by farmers?

After a comprehensive survey of previous research in this area, the paper focuses on a method for measuring instability (Chapter 3), the way it can be used to arrive at accurate estimates (Chapter 4), and how this method can be used to assess the direct and indirect causes and consequences of agricultural instability in the Prairie economy (Chapter 6 and 7). Current programs are surveyed and analysed in Chapters 5 and 8, respectively. Finally, Chapter 9 provides a summary and conclusions.

CHAPTER 1: INCOME INSTABILITY

The Prairie economy has a long history of income instability, and this has always been one of the major complaints of western farmers insofar as their place in the Canadian economy as a whole is concerned. But we must ask ourselves if an unstable cash flow is necessarily worse, economically speaking, than a stable cash flow. Assuming the total cash flow is the same in each case, there is no simple answer to this question. It depends on what assumptions are made about, for example, the marginal utility of income, the possibilities of predicting instability, whether the market makes efforts to counter instability through transfer payments, the structure of the market itself, etc. Economists agree, for instance, that if it were possible to predict such instability with complete accurary, adjustments could be made to eliminate all harmful effects.

This question becomes easier to answer if we abandon the assumption that the totals of stable and unstable cash flows must be idential: in this case, uncertainty comes into the picture. Since uncertainty has a negative value in economics, the stable cash flow in the preceding example would now be considered preferable. Financial markets have long been aware of this fact, and high returns have always been linked to high risk.

Much research has investigated how decisions are made in a context of uncertainty, but instability as such has not been the

subject of much study. Although economic studies on measurement of instability can be found, the main preoccupation has been stabilization. For example, the problem of dividing profits and costs between consumer and producer (using consumer or producer surpluses) in a price stabilization program is a common topic. On a more practical level, studies are often concerned with the economic assessment of specific stabilization programs.

Stabilization of prices, supply and income is very common in the fram sector. The political, economic and social merits of farm stabilization programs to establish and maintain a stable agricultural industry are recognized all over the world. There are many reasons for farm income stability: fluctuations in the price of the farmer's product, fluctuations in output (often caused by factors beyond the farmer's control), and fluctuations in the price of inputs. It must be remembered that, since supply and demand curves for a product are considered inelastic in the short term, any shift in these curves will have a greater impact on prices than on quantity sold, resulting in wide fluctuations in producer income.

Structurally speaking, then, farm incomes can be considered less stable than those in other occupations or activities. This is an extremely important assumption, and there are two points to be made here. First of all, what occupations should be considered the benchmark against which stability is rated -- labourer, public servant, indpendent contractor, etc.? Secondly, is farm income

instability correlated to higher earnings that compensate for the risks involved in farming? In this case, government intervention may not be appropriate and could even have detrimental effects. But here again the question remains: higher earnings in relation to what occupations?

In order to answer this question properly, instability and income levels in other occupations would have to be established, greatly increasing the size of the task at hand. Without denying the importance of these issues, this study is forced to limit itself to farm income instability.

The situation changes, however, when there are institutions that will assume the risk inherent in farming activities for a fee. If these organizations are in perfect competition with each other, the premium paid for the service will be minimal. In actual fact, the involvement of private institutions in the financing of farming operations is quite recent, as noted in Intervention and Efficiency, a study by the Economic Council:

> In fact, the generalized credit gap affecting the farm sector from the Great Depression to the 1970s has been significantly reduced, as private lending institutions have increasingly entered the farm finance market. This financing may not, however, be available in the form best suited to farmers' needs. Farmers occasionally have problems in meeting their financial obligations because of the lack of a financial instrument adapted to structural factors that can prevent farm operations from generating a cash flow comparable to that in other industries. (p. 87)

As the report indicates, as far as their loan obligations are concerned, farming operations tend to be treated like any other

business. Given their inherent instability, this means that in comparison with other industries they are at a disadvantage. The risk involved in farming is never assumed by the marketplace. To counter income instability, the farmer may try to adapt his operations by diversifying production (leading to reduced scale economies), taking up off-farm employment, etc. These alternatives themselves represent deviations from the optimum.

At the aggregate level, what impact does instability have on farm incomes? For simplicity's sake, let us take for granted that the farm sector constitutes a large segment of the economy. In the case of the Prairies, this is a reasonable assumption.

A sharp drop in incomes promotes the aggregated demand curves for goods, labour and capital to shift to the left. In a Keynesian economy, where prices are downwardly inelastic, unemployment rises as a result; in a neo-classic economy, any rise in unemployment will be mitigated by falling prices and lower wages. If, on the other hand, an economy experiences a general increase in incomes, the demand curves will shift to the right, at least in the short term, because of inelasticity in the corresponding supply curves. The resulting bottleneck leads to a general rise in prices.

In a small open economy (like the Prairie provinces, which trade both with the rest of Canada and with other countries), an economy where the value of national currency cannot be changed to any great extent, this price rise will have a considerable impact on

foreign trade. Exchange rates will change in response to the rise in the price of exported products and the relative fall in the price of imported products. As a result, imports will increase while exports decline.

The premier of Saskatchewan, Alan Blakeney, speaking on behalf of the other western premiers at the Western Economic Outlook Conference in 1973, provides a description of the impact of agricultural instability on other sectors of the economy:

> The West needs a strong commitment by the federal government to stabilize returns to farmers, whether they produce grain, livestock, or specialty crops. Market instability has resulted in a boom and bust cycle on farms, in rural communities, and has adversely affected the development of processing industries. This has led, in turn, to wide swings in the levels of production. Indeed, so long as this persists, how can we hope to develop processing industries based on farm products? How can we hope to get the secondary industries which all of us here are talking about during these past three days? (p. 123)

As discussed earlier, instability does not necessarily mean that resources are unequally divided or that government intervention is required.

In certain circumstances, however, high instability can be harmful. This is why measuring farm income instability on the Prairies to see how far it can swing is so important. Armed with this information, it will be easier to make intelligent judgments on the need for government intervention now and in the future.

CHAPTER 2: PREVIOUS STUDIES

There is an extensive literature dealing with the farm sector. Government studies, royal commissions and special government studies constitute one important source of information, and there is even a specialized Canadian periodical that deals exclusively with agricultural economics. Since it is well known that instability is a problem in this sector, one would expect that several works could be found on this topic. Unfortunately, this is not true. Farm sector instability is usually discussed briefly, in perhaps one or two paragraphs, before such reports turn their attention to an analysis of public and private stabilization programs and their relative merits.

This survey of previous studies in this area is divided into two sections: the first deals with the causes of instability according to whether it affects the demand or the supply curve, and the second section discusses the consequences of instability on the farm sector and on the non-farm sector.

2.1 The Causes of Instability

2.1.1 Supply

2.1.1.1 Natural Causes

Among natural causes, weather variations naturally spring first to mind. Drought, overabundant rain or an early frost can destroy the crops in a single region or in an entire country. Continuation of any of these conditions for extended periods can have an even more serious consequence -- soil erosion, which can leave rich soil unfit for agriculture.

Williams' (1969) study of this problem comes to the following conclusion:

> Weather variations have a profound effect on prairie wheat production. Their economic impact is illustrated by the fact that over $600 million of the difference in value between the 1961 and 1966 Canadian prairie wheat crops can be attributed to differences in weather conditions. (p. 109)

Natural causes also include biological factors. Cattle or crop diseases and infestations of microbes, viruses, insects, etc., can severely affect crops. Although the destructive capabilities of such pests continue to lessen as a result of scientific research, unfortunately there is always a new one waiting in the wings.

2.1.1.2 Production Cycles

Because of the lag between the decision to produce and the appearance of the final product (one year in the case of pork and three in the case of beef), production follows a cyclical pattern. Cycles are characterized by a period of low prices due to an abundance of product, followed by a period of rising prices as the product becomes increasingly scarce on the market.

The decision to produce is made on the basis of imperfect information in a context of uncertainty by independent and widely separated individuals who constitute only a small portion of the market. If the price of the product drops for one reason or another, producers will liquidate their stocks to maintain their level of earnings. This drives prices even lower. Once stocks are gone, the product becomes scarce and prices rise, so that producers once again have an incentive to produce. After the production lag, the product again becomes plentiful on the market, prices start to fall, and the cycle begins anew. The existence of cycles is a result of having producers entering and leaving the market at the same time.

Pugh (1978) analyses the cattle cycle in Canada for the 1950-77 period. He notes that the 1973-74 hikes in grain prices "contributed significantly to the reduction phase of the cycle" (p. 28). He believes there is an independent beef cycle that is

highly vulnerable "to external factors not directly related to the sector."

Petrie (1974), in analysing the hog cycle in Canada over the 1948-72 period, describes it in the following terms:

> The hog cycle averaged almost three years in length with an expansion phase of 21 months and a contraction phase of 14 months. There was an average increase of 27 per cent in the eight periods of expansion and a 26 per cent decrease during the seven periods of cyclical decline in hog slaughter. Expansion averaged 74 months and contraction 32 months for the two cattle slaughter cycles from 1948 to 1972. The average amplitudes wwere +34 and -23 per cent, respectively. (p. 29)

The influence of international markets on Canadian cycles for these two products will be discussed later.

2.1.1.3 Technological Advances

While it is sometimes a stabilizing force, technological advances can cause serious imbalances in the market for a particular farm commodity. The creation of a new product can cut into or even completely destroy the demand for a competing product. Improvements in farm marchinery, irrigation and drainage techniques, livestock and crop yields, cattle feeds, insect control, etc., may all lead suppliers and consumers of a parrticular farm commodity to switch to another.

2.1.1.4 The International Quota System

International trade in farm commodities has grown considerably since the end of the Second World War. The instability of a product on the international market may have an international dimension. When for one reason or another a country changes its supply or demand pattern for farm commodities on the international market, some instability is introduced, to which the other countries must adjust. Because the supply and demand curves for farm commodities are inelastic in the short term, such instability, caused by changes in the quantity of product traded by one country, will have a greater than proportional impact on prices, leading to "disproportionate" adjustments by the remaining partners. The greater the involvement of the original country in the international market, either before or after the change, the greater will be the effect.

What prompts a country to make changes in its international trade patterns? Besides attempts to stabilize its balance of payments, variations in exchange rates and changing weather conditions, there is a reason that sometimes passes unnoticed, as mentioned by Johnson (1975):

> If governments are interested in price stability for agricultural commodities, their primary interest is in stability of prices within their own countries. This is not to say that governments have no interest in the stability of prices at which farm products are traded among nations, but past behavior of most governments and even a cursory examination of policies and programs designed to stabilize prices indicate that there is far less concern

> with the stability of prices outside than inside national boundaries.
>
> In fact, the concern of most governments with internal price stability, with little or no regard for external effects, is comparable to the primary concern of governments with internal resources adjustments in agriculture. The agricultural and trade policies that were followed in recent years by most industrial nations to minimize their own need to adjust, forced other nations to undergo relatively larger adjustments than would have been needed if all nations had participated on a more equal basis in the required resource adjustments. (p. 823)

When a country has a stabilization policy, this means that it is a producer of the commodity in question, at least for its own market. Any imbalance in the domestic market can be compensated for by buying or selling the product or a substitute product on the international market. This introduces disturbances into the international market, the intensity of which depends on the market share of the country in question before and after the change.

This happened in 1973, when the Soviet Union, responding to a sharp drop in its domestic grain production, began to import large quantities of grain to meet its needs. As Johnson (1977) points out:

> Many countries in addition to the Soviet Union follow price maintenance policies that contribute to international price instability by equating supply and demand by variations in exports or imports. Illustrations include the grain price policy of the European Community, the stabilization of internal wheat prices in Japan through paying a substantial subsidy on imports, the use of export controls in Canada and Australia to hold wheat prices for domestic food use substantially below export prices, and the stabilization of grain prices in China. A number of other countries in Western Europe follow similar policies. In all, including the Soviet Union, the countries that were insulating their domestic markets from rising prices abroad in 1973/74 and

> 1974/75 consumed more than one-half of the world's grain in those years.
>
> Thus, while the instability of international grain trade results in significant part from production variability in the Soviet Union, the magnitude of the resulting price fluctuations is determined by the domestic price policies of many other nations as well. In other words, were the Soviet Union the only nation that attempted to stabilize internal prices by varying its grain trade, the ensuing international price instability would be much less than has actually occurred in recent years. (p. 28-39)

The same is true of the international beef market. As Pugh (1977) explains:

> Since demand for foreign beef in the importing countries depends on the beef cycles in those countries, and if the exporting countries exhibit the same behavior in terms of rapid expansion of production in response to higher export prices and if importing countries retain import restricting policies, then the price instability in the world beef market can be expected to continue.
>
> From Canada's point of view, this means that pressure on domestic prices from low-priced imports can be expected to occur again in future. (p. 8)

2.1.1.5 Inputs

The impact of an outside factor that causes a rise in the cost of inputs will lead to substitution in their use. In addition, the result can also lead farmers to make production substitutions. For example, a rise in the cost of grain may prompt some farmers to switch from growing grain to raising cattle.

An increase in the cost of a particular piece of machinery can also lead to the substitution of one farm commodity for another.

Leggett (1976) describes this phenomenon in the following terms:

> In response to market price and production cost relationships between different agricultural commodities, producers tend to shift production resources from one commodity to another. The most common example is the shift in Western Canada into feeding grain through livestock when livestock prices are high relative to grain prices, and the shift to direct marketing of grain when grain prices are high, relative to livestock prices. Because of lags involved in livestock production, these shifts are not immediately reflected in price levels with the result that the degree of the shift is often larger than justified, thus further compounding unstable prices in both sectors. (p. 33)

Lastly, because of the inelasticity of farm product supply curves, even a small shift in one such curve can have an enormous influence on prices.

2.1.2 Demand

a) Elasticities

The equilibrium of the farm market is not as sensitive to changes in demand as to changes in supply. Total demand for farm products is inelastic in the short term, although the demand for a specific farm commodity can be very elastic because there are ready substitutes available for most farm products. Generally speaking, the cross-elasticities of demand for agricultural products are considered to be high.

b) Consumer Preference

A change in taste on the part of consumers can lead them to abandon a particular product, creating a disturbance that can extend to other markets.

2.2 The Consequences of Instability

2.2.1 In the Farm Sector

The most immediate consequence of farm sector instability is obviously the year-to-year fluctuation in farmers' earnings; this is, in fact, the subject of the present paper. On the heels of a good year may come a bad year. When this happens, a certain number of farmers are forced out of business. It is not necessarily the least efficient operators who are affected, but those with low equity, those unwilling to take further risks, or those who are simply unlucky.

Instability also has a direct influence on upstream industries (machinery, fertilizer, feeder grains, etc.) and downstream industries (transportation, handling, packing, marketing, retailing, etc.). They too must adjust their use of capital and manpower, increasing it in good times and cutting back in bad times. These actions have an impact on the economy as a whole.

Let us look at an example. Following excellent wheat harvests in Saskatchewan in the 1960s, the federal government instituted a crop acreage reduction program (the LIFT program -- Lower Inventories For Tomorrow) in 1970, which was successful in reducing the amount of wheat produced. The impact of this program on International Harvester and the rise in demand after the international price was raised in 1973 and 1974 are described in the following terms by Munro (1976), the company's Marketing Director:

> It should be noted that this production cycle at the Hamilton plant was in response to a demand cycle in just one province and in our export markets that were affected by the shift in world grain demand. During 1971 and 1972 when production cut-backs were at their worst, other phases of Canadian agriculture were relatively prosperous -- and maintaining a reasonable demand for farm equipment. Nothing could more dramatically underscore the vulnerability of the industry than this effect of a decline in just one segment of agriculture.
>
> This enforced restraint on production was especially disappointing because it compounded the problem of maintaining balanced plant production and employment throughout the year. Seasonal swings have been an unfortunate and costly tradition in this industry that is so totally tied to seasonal demand. This has been costly to employees, and costly to the industry.
>
> The upturn that began in 1971 was not unexpected. Our instincts told us that the cycle from peak to valley would return to peak demand again. But how soon? And how far? Those were the questions that the industry faced as the upward trend began.
>
> There was, as I have said, ample inventory to meet the immediate demand. But restoring full production quickly enough to stay abreast of the sudden upward demand curve has been far from easy. It was certainly not just a question of pushing a "start" button on the assembly lines. The many sources for materials and components were asked to move rapidly from low output to peak output, and, like the farm equipment manufacturers themselves, to invest in plan modernization and expansion hard on the heels of an unprofitable period. (p. 155)

Sector instability may also tend to reduce investment capital, although opinion on this question is divided (see Robinson, 1975, p. 772).

2.2.2 In the Non-Farm Sector

The impact of instability in the non-farm sector can range from significant to negligible depending on three factors:

a) the importance of the farm sector to the economy;
b) the importance of exports and/or imports in the farm sector;
c) the farm sector contribution to exports.

If the share is large in each case, the consequences for the rest of the economy can be considerable -- financial markets, the inflation rate, the interest rate, the value of currency, the balance of payments, etc. can all be affected. Sanders (1977) measures the impact on the American economy of the grain price hikes of 1973-74, which were caused by the entry of the U.S.S.R. into the market as a grain importer:

> The grain price increase accelerated the rate of increase in the food component of the U.S. Consumer Price Index from 4% to 20%. Since food accounts for about 25% of the CPI, the effect was to double the general rate of inflation, from 4% to 8% in 1973, i.e., before the effects of the energy crisis were felt. Further grain price increases in 1974 added to the inflationary effects of the oil increase.

> These inflationary effects are irreversible as they get locked into the wage and price structure of the non-agriculture sector which is flexible only upward. They are then transmitted to the agricultural sector, raising food costs permanently in proportion to the general rate of inflation. Inflation, in turn, brought on unemployment and recession. (Cited in Ellison, 1980, p. 77)

Grain is one of the cornerstones of the economy, the starting point for many essential products and a major component of the price of meat. Any increase in the price of grain therefore has serious repercussions on other farm products.

Robinson (1975), however, expresses the following opinion: "For grains, the estimated farm weight in the CPI is only 0.6%. Even a doubling of grain prices would now add less than 1% to the overall index" (p. 773). Here only the farmers' share of the final price is being considered; marketing costs are excluded. Robinson is also not taking into account the delayed effect on other farm products, and concludes: "If all farm prices were doubled, with no changes in marketing costs, the CPI would be expected to rise somewhere between 7% and 8%" (p. 774).

In 1977, the Canadian Department of Agriculture released a report titled Orientation of Canadian Agriculture: A Task Force Report. A discussion of instability took up several pages. According to the report, the causes of instability are as follows:

> One is the high proportion of agriculture located in the prairie region where the variations in rainfall from year to year result in large differences in output which are

largely outside the control of the producer. Another is that Canadian agriculture is particularly exposed to fluctuations in international commodity markets because of a fairly open trade policy and the fact that about 40 per cent of agriculture's gross income is derived from international trade. The third reason is that the nature of the supply and demand elasticities for the individual commodities is such that changes in agricultural output and prices do not offset each other sufficiently to stabilize gross income. For example, the output of the large grain producing sector in Canadian agriculture has a very low correlation with the prices received for the products. Finally, the relative stability of prices of cash inputs results in a fairly stable cost structure which makes farm net income even more unstable than gross income. (p. 25, Vol. III)

In this report, instability is measured by assigning a coefficient of variation to deviations from a trend. The table below gives the results. It can be seen that the year 1974-75 had quite an impact on the coefficients of variation for grain.

Coefficient of Variation of the Deviations from a Linear Trend in Production, Prices and Farm Cash Receipts, Canada, 1951 to 1975

Products	Production		Prices		Farm Cash Receipts	
	1951-75	1951-73	1951-75	1951-73	1951-75	1951-73
Wheat	24.6	25.4	41.2	12.5	45.0	26.4
Barley	32.1	34.8	39.7	17.3	73.3	44.9
Corn	23.5	26.3	30.0	13.1	76.6	53.1
Rapeseed	69.1	82.6	45.9	21.9	64.7[a]	67.2[a]
Cattle, numbers	8.6	8.6				
Cattle, dressed weights	5.2	5.3	28.3	25.2	21.4	16.0
Hogs, numbers	11.1	10.3				
Hogs, trimmed weights	12.0	11.4	27.8	21.2	26.2	22.6
Cheese	7.9	7.2	25.1	15.1		
Butter	11.0	9.5	11.8	7.6	20.36	6.5
Milk	6.9	6.1	23.8	11.2		

a Starting from the year 1958.

Source Agriculture Canada, Task Force Report, 1977, Vol. III, p. 26

It can be seen from this table that the widest fluctuations during the two periods were in grain prices, which more than tripled in the case of wheat, and doubled for other grains. Note also that grain production varied less between 1951 and 1973 than between 1951 and 1975, which means that 1974-75 production was more stable than during the rest of the study period.

The report briefly analyses the consequences of instability according to whether consumption or purchasing of inputs was affected. Its impact on the non-farm sector is not examined.

Ellison's (1980) study, titled The Canadian Interest in an International Wheat Agreement, prepared for the Centre for the Study of Inflation and Productivity, examines the impact of grain price increases on the Canadian economy. With the help of Statistics Canada's input-output model, dating from 1974, the author proposes four domestic price increase scenarios for grains and meat, and four other scenarios where such increases are coupled with rising prices for imported farm products. The impact is calculated on the farm sector (broken down into 20 categories) as well as on "some selected items of consumer expenditure which showed a significant increase in price," 15 to be exact. The simulation involving a one-third rise in grain and meat prices, with no change in import prices, caused the prices of the following items to increase as follows:

	Per cent
Alcoholic Beverages	1.5
Non-Durable Household Supplies	1.1
Expenses in Restaurants and Hotels	2.7
Consumer Price Index	2.4

Other results indicated that a doubling in grain prices would provoke a 9.3 per cent increase in the food component of the Consumer Price Index and a 2.7 per cent rise in the index as a whole. The author concludes that: "During 1973 and 1974, the actual rise in feed grain price was 80 per cent, a rise which suggests this played some significant part in the high inflation of this period" (p. 77).

In his book, titled The Economics of Farm Problems, Hathaway (1978) devotes a few paragraphs to a brief discussion of the consequences of farm sector instability. Hathaway's approach is to gauge the impact of such instability on non-farm incomes and on national revenue. According to his findings, increases in production cause farm incomes to fall and non-farm incomes to rise. The use that is made of the extra product by non-farmers remains to be determined; it may be spent on agricultural commodities or some other goods.

If the fall in farm income is caused by a change in foreign demand and is not balanced by increased foreign demand for other goods, national revenues decline. Hathaway concludes by stressing that:

> If enough people believe that farm income is an important determinant of national prosperity, then conceivably changes in farm income might influence business expectations, investment, and, consequently, general levels of employment and income. (p. 159)

Lastly, Munro (1976) demonstrates with the help of charts that there was a very strong correlation for the 1965-74 period in Saskatchewan between gross farm incomes and farm equipment and tractor sales, sales of private and commercial motor vehicles, and retail sales. Agriculture counts for a very large portion of Saskatchewan's economic activity (Munro estimates it at 50 per cent), and so the consequences of instability in this sector are indeed substantial.

2.3 Summary

The Causes of farm sector instability are as follows:

a) nature (weather, biological factors)
b) existence of production cycles
c) technological advances
d) international factors
e) increases in costs of inputs
f) supply and demand curve elasticities
g) shifts in consumer preference.

The consequences of instability in the farm sector include: fluctuations in farm incomes, variation in the utilization of capital and manpower by upstream and downstream industries, and occasionally farm abandonment. In the non-farm sector, there can be significant consequences on inflation, the balance of payments, retail sales, employment, and so on.

CHAPTER 3: MEASURING INSTABILITY

In this chapter, the concept of economic instability will be defined and applied. Various measurement methods will be briefly examined in order to identify those most suited to our objectives. The variables that can best describe instability in the economy as a whole and in the farm sector in particular will then be looked at in some depth. In this chapter, the theory underpinning the entire study will be outlined.

3.1 Definition and Measurement Methods

Before instability can be measured, the concept must first be defined. The Organization for Economic Cooperation and Development (OECD, 1980) defines instability as follows:

> Market instability, as observed from analyses of past behavior of various parameters (revenues, prices, volumes produced, consumed and traded, and stocks) is chiefly defined qualitatively and is seen as the situation which arises when changes are of such amplitude or frequency that, far from providing useful signals as is the case with market fluctuations, they exceed the capacity of producers and consumers to adapt or manage without significant resource waste and misallocation, losses or hardship. (p. 2)

Markets are never (or at least hardly ever) stable. Exogenous or endogeneous factors cause shifting of the supply and/or demand curves, and prices rise or fall according to the relative scarcity

of the product. Agricultural markets are subject to extensive fluctuations that can be unpredictable and capricious, often reversing themselves from one year to the next. The fact that these fluctuations are unpredictable is important; otherwise, we would be dealing with a particular kind of instability -- cyclical instability. Even in this case, the regular course of the cycle can be profoundly disturbed by exogeneous factors, as was seen in the view of previous studies. Instability has perverse effects, since resulting adjustments, with their strong impact on short-term resource allocation, can actually contribute to instability in the long run. The present study concentrates on annual instability, that is, fluctuations in parameters on a year-to-year basis, which cyclical and seasonal instability are excluded.

The simplest way to measure instability is to calculate the difference between the highest and lowest values observed. In order to make comparisons between observations, this difference is divided by the average of all observations. However, one abnormal observation can seriously bias the measurement. The dispersion of each observation can be described by the variance or "standard deviation," which is the square root of the variance and which gives the average difference between observations of the variable, relative to its mean value.

Instability is most often measured by calculating the annual percentage change. For example:

Year	1	2	3	4	5	6	7
Value	100	90	110	105	108	115	100
Percentage change		-10%	+33%	-12.5%	+3%	+6%	-13%

It is difficult to interpret these results, since the percentages only have meaning in relation with the previous year, and so cannot be easily compared. Interpretation is limited to observing that the variable in question experienced a rise or fall in percentage change between Year t and Year t+1. Moreover, the behaviour of the variable over time cannot be determined with certainty -- whether it rose or fell, or whether it remained steady throughout the study period. It is clear that this approach is too restrictive for our research.

At the very beginning of Lundberg's (1968) book, the author states:

> When we speak about economic instability, some kind of reference to stable or more stable conditions is always implied. The development of the real gross national product of a country does not follow a smooth path but shows irregularities that can be described as deviations from or fluctuations around such a smooth path. This is a kind of economic instability that can be observed and measured -- for example, with a trend, determined by statistical or economic criteria, serving as the base of reference. (p. 3).

A farmer calculating his income for the coming year probably follows more or less the same process intuitively. All things being equal (this stipulation is important, since farm incomes

are more subject to exogeneous factors than other types of income), the farmer will estimate the rate by which his income increased annually over the last few years, and will multiply his previous year's income by this figure (if the previous year was a typical one). His income will be considered "normal" if it is approximately equal to his estimate, and low or high it it is under or over his estimate. Instability arises because the farmer's guesses are very often off the mark, that is, his actual income is different from that anticipated.

In this paper, instability has been defined in terms of deviation from an expected growth curve. The curve itself can be measured in a variety of ways. For the purposes of this study, an equation of the following form will be used:

$$(1) \quad X_t = \alpha\, e^{\beta t} \varepsilon_t$$

$$(1') \quad \ln X_t = \ln \alpha + \beta t + \ln \varepsilon_t$$

where X_t = time series X at time t
α = constant term
β = rate of growth
ε_t = error term at time t
ln = natural logarithm, base e.

This estimation method has three advantages. First of all, the error terms, expressed as natural logs, give a percentage estimate of the degree of instability. In fact,

(1) $X_t = \alpha e^{\beta t} \varepsilon_t$

(2) $\varepsilon_t = X_t / \alpha e^{\beta t}$

(2') $\varepsilon_{t-1} = (X_t - \alpha e^{\beta t}) / \alpha e^{\beta t}$

(3) $\ln \varepsilon_t = \ln [1 + (\varepsilon_{t-1})]$

(4) $\ln (1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \ldots$

(4') and $\ln (1 + x) \cong x$ if x is a low value

(5) $\ln [1 + (\varepsilon_t - 1)] = (\varepsilon_t - 1) - \frac{(\varepsilon_{t-1})^2}{2} + \ldots$

Therefore,

(6) $\ln \varepsilon_t \equiv \varepsilon_{t-1}$

if ε_{t-1} is a low value (Taylor's series).

(7) $\ln \varepsilon_t = (X_t - \alpha e^{\beta t}) / \alpha e^{\beta t}$

The term ε_{t-1} must be near zero, because ε_t is close to unity as a result of equation (2), since the estimated value by the growth curve $\alpha e^{\beta t}$ is close to the real value of X_t. The deviation is a percentage because, as a result of (2'), it is divided by the growth curve. Moreover, by using $\frac{t}{T} \sum_{t=1}^{T} |\ln \varepsilon_t|$, where T equals the number of years in the period, the average annual instability can be calculated.

Second, because it yields a percentage and because the growth curve of economic variables is generally positive, this measurement method assigns as much relative weight to the early years of the period as to the final years. Consequently, the absolute value in early years is higher than in later years, giving a more accurate picture of the situation. A $100 change in income has more significance for a worker earning $1,000 a year than for another earning $5,000, in constant dollars. Similarly, a loss of 2,000 jobs has a greater impact on a small economy with a total of 25,000 jobs than on a larger economy with 250,000. This means that instability amounting to 3 per cent at the beginning of the period is considered to be as important statistically as the same proportion of instability at the end of the period, despite the fact that the absolute values involved are not equal.

The third advantage offered by this approach is that the instability of variables can be disaggregated. Equation (1') can be divided into a series of subequations that are all components or elements of the original equation:

$$\ln x_{1t} = \ln\alpha_1 + \beta_{1t} + \ln\varepsilon_{1t}$$
$$\ln x_{2t} = \ln\alpha_2 + \beta_{2t} + \ln\varepsilon_{2t}$$
$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$
$$\ln x_{it} = \ln\alpha_i + \beta_i t + \ln\varepsilon_i t$$

where the variables x_i are elements of the variable X_t in a time series and the variables α_i, β_i and ε_i are the parameters of each element of the aggregate function (1'). If the increase in each element can be described in terms of simple linear time-ordered functions (and not logarithmic ones, as earlier), not only will the aggregate function be equal to the sum of the element functions, but also the sum of the parameters will be equal to the parameters in the original equation:

$$X_t = \sum_i x_{it} = \sum_i \alpha i + t\sum_i \beta_i + \sum_i \varepsilon i$$

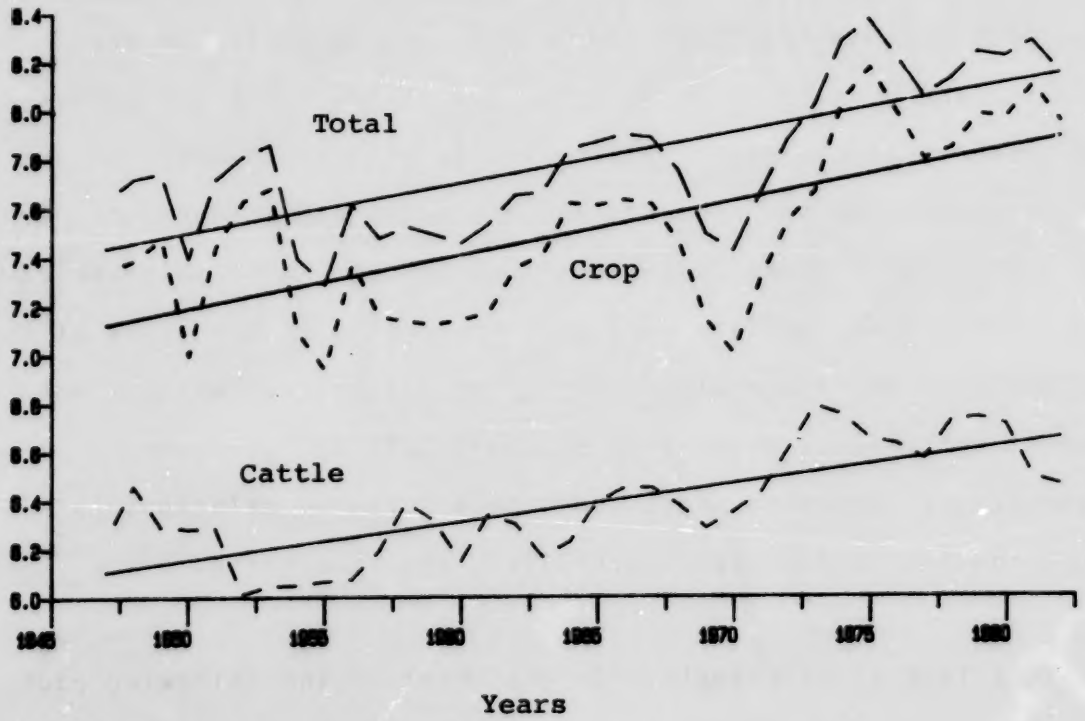
However, the logarithmic function is not linear, so this hypothesis is only partially confirmed. Fortunately, in our results, the deviations between the sum of the estimated curves of the elements and the aggregate curve, as well as between the sum of instability of the elements and the aggregate instability, are not very large. There is an advantage in being able to break down the aggregate instability variable; by looking at the signs of the residuals of the aggregate equation, it can be seen whether one element contributes negatively or positively to aggregate instability. Opposing signs indicate a negative relationship (contributing to aggregate stability), and vice versa.

Let us look at an example. In the chart on the following page, it can be seen that total farm income in Saskatchewan in 1950 was below the growth curve, and so the residual was negative. Two-element disaggregation of the total income reveals that one

element, farm income from grain sales, had a negative residual and the other, income from beef sales, had a positive residual. This means that income from grain sales was running below the trend, thus introducing aggregate instability, and that income from beef sales was above the trend, thus reinforcing aggregate stability. Note that weights are given to each component to reflect the proportion in which it contributes to the total farm income.

FARM INCOME - SASKATCHEWAN

(Constant 1981 Dollars)



3.2 Selection of Variables

What variables can be used to measure instability in the Prairie economy and its farm sector? The variables chosen must reflect accurately the susceptibility of the economic system to both exogeneous and endogeneous shocks. The importance of the farm sector in the economy determines the level of instability in the economy as a whole, because the farm sector is in general intrinsically more unstable than other sectors; thus, an economy based primarily on agriculture is bound to be more unstable than others. The two main considerations in the selection of variables are their direct link to the standard of living of the individual and their capacity to be disaggregated. This latter criterion is more desirable than crucial, but will provide us with more information, as explained earlier.

3.2.1 Farm Sector Variables

The following variables were selected as being the most promising for measuring farm sector instability: income, price (of various commodities), sector employment, cultivated area, production, yields, and cost of inputs. The advantages and disadvantages of each of these variables will now be examined.

a) Income, Price and Production

As discussed earlier, the first thing that comes to mind in dealing with farm sector instability is farmers' incomes. There

are several ways income can be measured: gross, net, per capita, per full-time farmer, per part-time farmer, per farmer with sales of over x dollars, by farming family, etc. Since full-time farmers are most affected by instability, we will look at their incomes. Net income cannot be disaggregated and so is less promising than gross income, since a quick check of statistics shows that gross income equals the sum of the sales of all agricultural products plus compensation payments from the government plus payments-in-kind (on-farm consumption) plus inventory changes.

Cash receipts can also be disaggregated by agricultural commodity. Total cash receipt income can be broken down into its components: income from grain sales, beef sales, hog sales, etc. Disaggregation by province quickly reveals which province is most or least stable and in which agricultural commodity sales are most or least stable. The quality and amount of information on farm sector instability provided by these variables makes it worthwhile to examine them in greater detail since this is the most important section of the paper.

Analysis proceeds on the basis of multiplying price by quantity sold, which can be further divided into production by product: grain, beef, pork, and so on. Prices, naturally, cannot be further broken down, but the amount of grain produced can be disaggregated by yield per acre and by cultivated area.

b) Cost of Inputs, Sector Employment

A farmer faced with an increase in the cost of his inputs, all things being equal, will see his net income and standard of living drop proportionately. This is how an exogeneous factor can have serious consequences for the farm sector as a whole. Production of a particular foodstuff can be affected if, for instance, the price of a piece of farm machinery or a chemical fertilizer necessary to produce this commodity rises substantially. Such a price rise can be caused by external factors or may be the result of a bottleneck created by a sharp increase in demand for a particular input.

c) Cultivated Area and Yield Per Hectare

An increase in cultivated area coupled with a drop in yield can cancel each other out, resulting in no change to production. The behaviour of these two variables must be studied concurrently, because steady production does not necessarily bring stable incomes.

The effect of government programs designed to encourage or discourage the production of a particular commodity (for example, the 1970 Lower Inventories for Tomorrow Program -- LIFT) must also be studied concurrently with cultivated area.

3.2.2 General Economic Variables

What economic variables can be relied upon to tell whether the economy is unstable or not? The unemployment rate is used most frequently, since it has a direct impact on an individual's standard of living. Obviously, it cannot be further disaggregated.

Several types of income could also be used. Government taxes and transfers to individuals are certainly useful, since they represent an expenditure to use or consume a specific service. It would be better, however, to assess income instability after taxes have been subtracted and transfer payments added, since it is the result (personal disposable income) that is directly linked to standard of living. If all income, taxes, transfers, and so on are to be included, it is easiest to take the gross domestic production (GDP), which also includes inventory depreciation.

Employment depends on job opportunities and the unemployment rate. The unemployment rate only includes those who are actively looking for work, and excludes many others who have taken up other activities once their unemployment insurance benefits run out (such as adult education courses, among other things). Employment as a variable reflects instability in the economy as a whole, and its relationship to the welfare of the individual is obvious. Finally, it can be disaggregated by industry and activity.

The following section will examine the behaviour of the variables selected.

CHAPTER 4: BEHAVIOUR OF VARIABLES

4.1 Some Remarks About Data

4.1.1 Data on the farm sector are quite detailed and in most cases are available from 1908; some are even continuous from 1871! Data on the economy in general are either not available or do not date back very far. This fact says much about the historical importance of the farm sector in the Prairie region. In the case of variables for the economy as a whole, the reader should not be surprised to find the time series somewhat on the the short side.

4.1.2 For income tax purposes, the farmer has been able since 1973 to defer his cash receipts from grain sales. Rather than receiving this amount, he collects an equivalent voucher which is applied to January 1 of the following year. Overall, the amount received is the same, but the division of income between these years is evened out. For this study, deferred income is taken into account when the farmer actually receives it.

4.1.3 As is well known, the most significant change that has taken place in the farm sector over the last century has undoubtedly been the dramatic drop in the number of farms and farm operators. Larger farm sizes coupled with mechanization has increased productivity and overall agricultural output. Farmers' incomes can be divided into two parts: income from farming operations and off-farm income.

Brinkman (1980) shows in a study published by the Economic Council that off-farm income rises as farm commodity sales fall. One-third of Canadian farmers have gross agricultural sales of under $5,000 a year, representing less than 2 per cent of total agricultural sales. Of this group of farmers, those in the 0-$2,500 income bracket had negative net farm incomes in all years between 1971 and 1979, and those in the $1,500-$4,999 bracket in all years but 1972 and 1973. For these reasons, it is assumed here (as in Brinkman's study) that this group of people are not full-time farmers, and that they regard farming as more of a hobby than an occupation.

For other categories of farmers, off-farm income is much lower. However, because it constitutes a significant proportion of total farm income, off-farm income cannot be completely disregarded. This percentage is lower in the Prairie provinces than anywhere else in Canada, with the exception of Quebec.

It must be stressed that the results of the present paper do not include off-farm income. If it is assumed that full-time farmers use off-farm income to stabilize their annual income, then the results reported in this paper overestimate the instability in farmers' total incomes.

Before attempting to define some concepts associated with farm income, it must be emphasized that farm income is considered here on a <u>per-farm</u> basis, while at the aggregate level income is based on personal disposable income per capita.

4.1.4 Let us examine the various types of "farm incomes" for which Statistics Canada data are available. They are as follows:

1. Income from farming operations
2. Income-in-kind
3. Additional payments
4. Realized gross income
5. Operating expenses and depreciation charges
6. Realized net income
7. Value of inventory change
8. Total gross income
9. Total net income

Expenses account for the difference between "net" and "gross"; gross income minus expenses equals net income. Inventory change accounts for the difference between "realized" and "total"; realized income plus inventory change equals total income. Put more simply,

$9 = 1 + 2 + 3 + 7 - 5$

$8 = 1 + 2 + 3 + 7$

$6 = 1 + 2 + 3 - 5$

$4 = 1 + 2 + 3$

The difference between gross and net income does not pose any problems. The question of whether to use realized or total income, however, is another matter: should inventory changes be

considered or not? It should be emphasized first off that this is only a problem in the case of grain producers, and cattle producers will be discussed later. For example, assuming a price of one dollar per unit:

Production	11	12	7
Sales (realized income)	$10.	$10.	$10.
Inventories	+1	+2	-3
Total income	$11.	$12.	$ 7.

If stockpiling did not exist, and if every farmer sold what he produced, no more and no less, then "total income," as shown above, would be the obvious choice. Given the existence of inventories, however, cash receipts come into play. These take the existence of inventories into account, in that they can include sales from unsold inventories or, conversely, in that they can be lower than the total value of the farmer's products. For the purposes of this chapter, realized gross income (4 = 1 + 2 + 3) and realized net income (6 = 4 - 5) will be used.

In order to study farm income instability properly, we would obviously have to eliminate the effects of income stabilization programs while retaining the stabilizing factors employed by the farmer as an individual (inventories and income-in-kind). However, the stabilizing effects on farm income of most of these programs are more or less long term. The task of isolating and excluding their effect is beyond the scope of this work. This topic will come up again in Chapter 8.

4.1.5 The next issue concerns the variable to be used for cattle farming -- births, number of live head or number of head slaughtered. What exactly is cattle farming? It consists in investment in capital goods in order to produce a good that can be sold at a profit. The complication is that young cattle are raised to be sold as adults. The young animals thus represent part of the farmer's investment, and the slaughtered animal is the product. Everything else, including births, constitutes investment.

4.1.6 Among the causes of instability for grain farmers are exogeneous factors such as disease, insect infestations and, above all, weather. These are associated with the variable "yields per acre." The historical trend of this variable is steadily upward, and so any momentary or sudden drop in yields can be attributed to one of these exogeneous factors. Obviously, when cattle disease strikes, corrective measures such as vaccine, quarantine, and slaughter are quickly implemented by biological and veterinary experts in order to reduce to a minimum the risk of a regional epidemic. Since 1966, slaughter of animals condemned as unfit for human consumption has been running at between 0.2 and 1 per cent of total slaughter on the Prairies, a negligible figure.

4.1.7 Although the macroeconomic variables described in the following section do not correspond exactly to those selected in Chapter 3, it is for a good reason: data on the latter group of variables either do not exist or are historically inadequate.

4.2 Behaviour of Variables

4.2.1 In the Farm Sector

The following variables are analysed for the farm sector: realized gross income, realized net income, operating expenses and depreciation charges, price and yield of wheat (representing grain), and price and slaughter of beef cattle (representing cattle). For the economy as a whole, the variables are as follows: disposable per capita income, unemployment rate, level of employment, per capita employment earnings, gross domestic product, and net provincial revenues (at factor cost). For reasons of simplicity and because the constant term of regression is not particularly useful in this context, the growth rates (the β coefficients), the annual average instability rates (total of the absolute values of residuals divided by the number of years in the period), as well as the R^2 terms are laid out in one table. In the case of farm net income, dummy variables have been incorporated in the regressions to eliminate distortion caused by the 1930s, when negative figures sometimes appeared. If these were not corrected, Saskatchewan, for example, would post an annual average instability for total net income of 247 per cent! Before looking at the results in detail, it must be emphasized that the two time series used for the farm sector (1926-81 and 1914-80) include both the 1930s, when agricultural prices dropped significantly, and the 1940s, when prices skyrocketed as a result of the war. These must be considered isolated events that have not recurred.

Looking now at Table 4.1, at opposite extremes we find the following results: highest growth rate -- Alberta beef slaughter; lowest rate -- Manitoba wheat price. The highest annual average instability is found in realized net income in Saskatchewan, and the lowest in beef slaughter in Canada. Let us examine the results in greater detail.

The growth rates associated with the various income variables seem consistent from province to province, with the exception of realized net income in Saskatchewan, which posted an annual growth rate of 5 per cent. This rate is noteworthy, not only because it is expressed in constant dollars, but because we are speaking of net income, that is, the money that remains in the farmer's pocket after operating expenses and depreciation charges are deducted. This rate is almost 50 per cent above the rates in other provinces and in Canada as a whole. It may be that larger grain frams are responsible for this increasing growth rate.

The negative growth rate for the price of wheat is, to say the least, surprising. Although it was positive over the 1926-80 period, it was always under 1 per cent. Yield per hectare showed an annual growth rate of 1 per cent throughout the 1914-80 period. This statistic is somewhat misleading, however, because there were two opposing trends. The yield growth rate was negative at -0.7 per cent between 1914 and 1944, but positive at 1.9 per cent between 1945 and 1980. This means that wheat yields (measured in bushels per cultivated acre) have more than doubled (2.04) since the end of the war.

Overall it can be seen that variable growth rates are higher in Canada as a whole than in the Prairie provinces as a whole, with two exceptions -- realized net income in Saskatchewan and beef slaughter in Alberta. Wheat prices are virtually the same in Canada and in the Prairies.

The results for the annual average instability rates are exactly the opposite: the Prairie provinces post higher instability rates than Canada as a whole, with only two exceptions -- wheat price and wheat yields per hectare in Manitoba. There are several points that are immediately obvious from these results.

-- Realized net income is much more unstable than realized gross income. In Saskatchewan, the situation is by far the most unstable with an average annual variation of 61 per cent, a fairly high figure.

-- Annual average instability rates for beef slaughter and for expenses show little variation from province to province.

-- The "expenses" variable boasts the lowest annual average instability rates in all provinces.

-- A comparison of the annual average instability rates for yield per hectare and for wheat price reveals that the wheat price clearly exhibits greater instability than wheat yield in Manitoba and Alberta, while both exhibit similar degrees of variation in Saskatchewan.

-- Finally, once again it should be noted that annual average instability rates in Saskatchewan are higher for all variables but two (expenses and beef slaughter), and in these cases the province's experience is similar to its two neighbours.

Annual average instability rates are generally lower for Canada as a whole than they are for each individual Prairie province.

4.2.2 In the Economy as a Whole

Table 4.2 lists the results for the following variables: personal disposable per capita income, level of employment, unemployment rate, per capita employment earnings, gross domestic product at market price, and net provincial revenues at factor cost.

Variable growth rates are generally lower in Manitoba, followed by Saskatchewan and Alberta. Alberta's growth rates are clearly higher than in the other provinces and in Canada as a whole. The phenomenal economic growth spurt that occurred in this province between 1973 and 1981 is well known.

All annual average instability rates of variables for Canada as a whole are lower, with the exception of two provincial rates. This means that annual economic instability at the provincial level exceeds the national average. Saskatchewan has the highest

annual average instability rates for all variables except level of employment and unemployment rate, these distinctions belonging to Alberta and Canada, respectively. Of the three Prairie provinces, Manitoba has the most stable economy.

4.3 Instability in the Farm Sector Over Time

Table 4.3 shows the rates calculated for four periods based on two regressions, one for the 1926-81 period with results for 1926-45 and 1946-81, and the other for the 1946-81 period with results for 1946-63 and 1964-81. The first period is divided in such a way as to isolate the Depression and war years from other years. The second period is divided into two eighteen-year periods.

Not surprisingly, the rates for all variables are higher in 1926-45 and in 1946-81, particularly income variables. As has been noted earlier, the Depression sent farm receipts tumbling, while the war years sent them soaring. It should be noted, however, that while variable annual average instability rates for 1926-45 are almost double those for 1946-81, the "expenses" variable remains the steadiest. Lower instability of yields is certainly due to technological advances that have allowed people to overcome and in some cases harness natural forces that previously were beyond their control. Luck also plays a role:

with the exception of the 1961 drought in Sasktachewan, there have been no major disasters on the Prairies.

It is perhaps more interesting to study the behaviour of variables subsequent to the war years. The only variable whose annual average instability rate rose substantially from 1946-63 to 1964-81 (approximately 65 per cent) was the price of wheat. A similar pattern was evident for barley, oats, and canola. These increases were primarily the result of the sharp price increases of the mid-1970s. This point is crucial: while the rates of other variables dropped or stayed the same, the instability of the grain price variable rose. This is significant because these factors have a considerable impact on cattle producers as well as on grain farmers.

Overall, annual average instability rates for income decreased slightly. The rate for expenses has remained remarkably steady since the war. Finally, the substantial reduction in the rate for yields, correlated with an increase for wheat, supports the hypothesis that farm incomes, at least from grain sales, depend much more on the prices than on weather or any other exogeneous factor.

The surprising drop in Saskatchewan beef slaughter from 20.9 to 7.4 per cent is conceivably due to herd build-ups as a result of government incentives around 1941-42 designed to ensure adequate

beef supplies for Britain. In 1946, after the war, a peak of 213,000 head slaughtered was reached, and slaughter continued to run strongly above its growth trend until about 1951. In other words, farmers benefited from government subsidies but, once they were eliminated, they returned to Saskatchewan's forte, which was grain. In the other provinces, however, herds were larger just prior to the war.

CHAPTER 5: GOVERNMENT STABILIZATION PROGRAMS

In succeeding chapters, our analysis of farm sector instability in the Prairies deals with the 1946-82 period exclusively, in order to avoid the economic distortions caused by the Depression and the Second World War. This chapter is divided into two sections, the first covering programs prior to 1945 and the second, programs after 1945. Only federal government initiatives are involved here, because at the time the provincial governments did not have the funds to participate except through their representations to the federal government. The discussion is limited to grain, because cattle revenues were much lower than grain revenues (four times lower, in fact) and because they were also more stable and so were not a major concern in the West at that time. Western development in the first half of the twentieth century was founded on grain, more specifically on wheat.

The second section discusses in as much detail as possible the various federal and provincial stabilization programs for grain and cattle that have been in operation from 1946 until the present day.

5.1 Programs to 1945

5.1.1 Early 1900s (1900-30)

In the early 1900s, with the establishment of railroads and the founding of the western provinces, government intervention in the farm sector was limited to legislation establishing some rules favourable to farmers in their inevitable clash with grain elevator operators and the railroads. Both of these latter groups enjoyed total monopolies in their respective domains -- grain storage and shipping locations in the case of the grain elevator operators, and grain transport in the case of the railroads. The first piece of legislation of this nature in 1886 established supervisory offices in Winnipeg, Port Arther, and Victoria for grain inspection. The second piece of legislation is even today the subject of much discussion: the Crow's Nest Pass Rate, which froze the rate charged for transporting grain at its 1897 level.

The first of what was to become a long series of royal commissions, the Royal Commission on the Shipping and Transportation of Grain, was created in 1899 in response to numerous complaints from farmers about questionable practices in grain loading and transporting. The federal government followed the recommendations of the Commission, and in 1900 passed the Manitoba Grain Act. In essence, this act established the office of a chief weighmaster hired by the government to ensure that

grain weighing operations were conducted fairly. The act also required railroads to provide fast and efficient service.

This act was amended in 1902 and 1903, and the 1886 act on grain inspection was amended in 1904. Another Royal Commission, which led to new amendments to existing laws, was set up in 1906. In 1912, the Canada Grain Act consolidated the powers of federal commissioners to supervise grain inspection, weighing, and other activities.

The government first intervened directly in 1917, when the Board of Grain Supervisors was established to regulate prices during the First World War. After the war, efforts to decontrol the farm sector were hampered by the presence of national government agencies in other countries with control over international trading deals involving their respective countries. The Supervisors Office became the Canadian Grain Commission in 1919, and its mandate extended only to the sale of the 1919 harvest. It bought wheat in advance, took delivery, stored it, transported it, and eventually sold it either to milling operations or abroad. The Commission remained in operation until 1922, at which time the federal government invited the provincial governments to assume responsibility in this area (including any losses); this the provinces declined to do. The federal government had rejected the recommendations of the Hyndman Commission in 1921, but later amended the Canada Grain Act in accordance with the

recommendations of another commission. However, grain producers were dissatisfied with the pace of progress, and decided to organize a voluntary system of provincial pools. These pools and their natural extension, the Central Selling Agency (CSA), which took control of wheat marketing, served farmers very well until 1930. Between 1925 and 1929 producers enjoyed a period of considerable prosperity as Canada's participation in the international wheat market climbed to a one-third share of the international market.

5.1.2 The Depression Years

The CSA was severely affected by the Depression. The record 1928 harvest, part of which was still in storage, coupled with an exceptionally good harvest in Argentina, where there were virtually no storage facilities, combined with the economic slump to send wheat prices tumbling on international markets. Europe reacted by raising tariffs on imports, including wheat, and by subsidizing exports. The CSA was soon in desperate financial straits. After an abortive attempt by the provincial governments, the federal government moved in to guarantee CSA's payments and loans. In actual fact, the CSA no longer existed; the provincial pools were already negotiating with a federal administrator who reported directly to the prime minister of Canada.

At the same time these problems were arising at home, Canada was actively pusuing multilateral consultations with both exporting and importing countries in the hopes of reaching international pricing agreements. This was in Canada's best interests because of its large share of the international market and the importance of this commodity to the Prairie economy. After several failures, the International Wheat Agreement was finally concluded in 1933. This agreement established a quota system overseen by the national governments of all countries involved. In 1935, the federal government set up the Canadian Wheat Board (CWB), again on a voluntary basis and modeled after the 1922 act, with the addition of federal government guarantees for any losses suffered by the Board. The CWB took over grain stocks formerly held by the CSA.

The same year saw a change of government, and the future of the CWB was cast in doubt. It was decided to appoint a committee to study the issue, during which time the activities of the Commission would be kept to a minimum. This committee eventually became the Turgeon Royal Commission of Inquiry, and its report, submitted in 1938, recommended that the CWB be abolished and that provincial pools be reinstated in its stead. However, conditions had changed since 1933. First of all, there had been the drought of 1937, the most severe in Canada's history, followed the next year by large international surpluses that hit western farmers hard. Finally, an imminent election made the government tread carefully in the area of its wheat policy. The result was that

the recommendations of the Turgeon Commission were not implemented; in fact, exactly the opposite course was followed.

Faced with evidence that high initial payments benefited only those who had crops to sell, and that farmers hit by a disaster of some kind were left to their own devices, the 1935 Canadian Wheat Board Act was amended to include a deferred payment based on yield per acre, as well as a ceiling of 5,000 delivered bushels per producer. For the first time, mention was made of income stabilization when speaking of the serious difficulties faced by western farmers. In 1939, the government introduced the Prairie Farm Assistance Act, which provided compensation payments to regions facing poor harvests because of a natural disaster. While launching this massive intervention in the farm sector, the government decided to counterbalance its involvement and perhaps leave an emergency exit for itself by following one of the Turgeon Commission's recommendations and encouraging the revival of provincial pools.

Involvement with the Commission was on a voluntary basis. Since producers were not contracted to the program, the Commission remained virtually inactive as long as prices were good; it was never sure what amounts of wheat it would be receiving when the initial payment was close to the market price, and it suffered losses when prices were down. Government involvement was necessary, however, in order to reach a new agreement through international discussions.

The serious difficulties faced by farmers during the 1930s forced the federal government to become involved in this sector as never before. And while the Depression prompted the government to put its foot in the door, the Second World War led it to kick the door wide open.

5.1.3 The Second World War

The immediate effect of the outbreak of war on the Canadian wheat industry was the sudden loss of Europe's share of Canadian wheat purchases. Coupled with a record crop in the West in 1930 (the first record set in 1928, and a new record set by the crop of 1940), the war led to world surpluses and falling prices.

Government intervention took two forms: production restrictions and income support. The government of MacKenzie King was re-elected in 1940, and a Cabinet committee was formed to study western grain farm policy. Extensive amendments were made to the founding act of the CWB. For the first time, it became mandatory to receive CWB approval for the size of cultivated area. These amendments included:

-- the establishment of delivery quotas of eight bushels an acre, authorized by the CWB;

-- the setting of a difference between the price paid by mills for wheat and the international price; and

-- loans to farmers storing wheat on-farm.

Another good harvest was expected for the following year, and a subsidized wheat acreage reduction program was set up. Farmers placing a portion of their crops in summer fallow and/or substituting feed grain for wheat production received compensatory payments. The 1941 harvest fell from the level of 514 million bushels set in 1940 to only 296 million bushels. The following year, minimum prices for oats, barley, and canola were set.

In 1943, the government took the final step over the line of complete involvement in grain production. The United States, which was supplying great Britain with pork and beef, was running out of cattle feed grain. This golden opportunity for Canada was marred by a shortage of boxcars, which had to be brought in from the United States. The CWB was thus forced to close credit transactions for grain and at the same time to take over total control of Canadian grain sales and purchases. The production and/or delivery restrictions were eventually eased as world demand for Canadian grain remained strong between 1943 and 1945.

By this time, the cornerstones of the federal government's western grain policy were established.

5.2 Programs after 1945

This section presents a non-exhaustive list of the main farm income stabilization programs that have been set up for Prairie producers since 1946. According to the definition used here, only those programs providing the farmer with "undirected" sums of money are discussed. "Undirected" payments do not have to be used by the farmer for a specific purpose or purposes. The list of programs designed to assist farmers is quite long. The original aim of these programs was not specifically income stabilization (even though, in the long term, their stabilizing effects are obvious), but the expansion, maintenance, and substitution of farm production through subsidies covering all or part of the incurred losses. As an additional criterion, only those programs that lasted for a year or more and/or involved a large budget are discussed here.

It must be remembered that there is a whole range of programs with indirect effects on farm income stability that are not mentioned here. For example, there are subsidy programs for milling operations and other Canadian farmers for the purchase of western grain, as well as subsidies for grain transportation (such as the infamous Crow's Nest Pass rate), not to mention special credit arrangements extended to countries that buy Canadian wheat. A complete examination of all subsidies and programs operating in the farm sector would undoubtedly be of great assistance in

evaluating the overall economic effects of government intervention in this sector. A more restrictive definition is used here because of the paper's particular field of interest.

5.2.1 Federal Government Programs

A detailed description of the amounts by province paid out annually under the following programs can be found in the Appendix: the Canadian Dairy Commission, the Crop Insurance Act, the Agricultural Stabilization Board, the Prairie Farm Assistance Act, Compensation for Animals Slaughtered and Quality Premiums subsidies, the Two-Price Wheat Policy, the LIFT Program, and lastly the Western Grain Stabilization Program.

1. The Prairie Farm Assistance Act, discussed previously in this chapter, was created to assist farmers hit by bad harvests. As we saw earlier, the government and farmers contributed equally to the program, although the government had to cover the program's deficits for all years but 1953, 1954, and 1957. Government assistance totaled $191,398,000 and farmers contributions $206,314,000. The program ended in 1975, when it was incorporated into the Crop Insurance Program.

2. The Program for Animals Slaughtered because of disease is still in operation in all provinces. It is funded entirely by the federal government. As shown in the Appendix,

subsidies under this program have generally been low. Public Accounts is the source of the amounts disaggregated by province up to 1964, and data for subsequent years were provided by Agriculture Canada.

3. The Quality Premiums program was set up during the war to encourage farmers to produce good quality meats for export to Britain. It was discontinued in 1970, since by then differences in the quality of pork and lamb were reflected in the market by differences in price. This program operated in all provinces as well.

4. The Agricultural Stabilization Program first started in 1959. The purpose of the program was to support farmers' incomes when revenues for a particular commodity fell or when input costs rose faster than market prices. The program's predecessor, the Agricultural Prices Support Act, was implemented in 1944 (itself replacing the old Agricultural Food Board). It cost some $400 million between 1944 and 1960, and helped stabilize revenues for 22 agricultural products, excluding wheat. Payments were calculated according to a fixed percentage of the average earnings from sales during the preceding five-year period, indexed to real production costs, and each year the prices of the products involved were set at a minimum of 90 per cent of the average market price during the preceding five years. It should be

noted that oats and barley grown under the jurisdiction of the Canadian Wheat Board, but not marketed by the Board, were included in the Agricultural Stabilization Program.

5. The Canadian Dairy Commission has almost total control over the Canadian dairy market, from the setting of production quotas to control over exports and imports to the setting of prices and the allotment of producer subsidies. For a detailed description of dairy policy in Canada, The Economics of Canadian Dairy Industry Regulation, a study by R. R. Barichello published by the Economic Council, is highly recommended.

6. The LIFT (Lower Inventory for Tomorrow) Program lasted only one year -- 1970. Wheat surpluses in the late 1960s led the federal government to offer producers incentives to substantially reduce their wheat acreage. At the time, this action was very controversial, since the public perceived that the government was paying farmers not to grow crops that were needed elsewhere in the world. The cultivated area for wheat fell from 24.4 million acres in 1969 to 12 million acres in 1970, and production dropped from 652 million to 312.5 million bushels. Some $63 million was paid out to farmers.

7a. The federal government's involvement with regulation of wheat prices began in 1967, and proceeded according to the following calendar of events:

August 1, 1967 - June 30, 1968

The government fixed a price of $1.955 a bushel. The government agreed to make up any difference between this and the world price, and $1.4 million was paid out to producers.

June 31, 1968 - June 31, 1969

No program.

August 1, 1969 - July 31, 1972

Same situation as in 1967-68, except that consumers, not government, paid for any price differences. Consumers subsidized producers to the amount of some $40 million.

August 1, 1972 - July 20, 1973

The government paid a subsidy (up to $1.045 a bushed) to producers to increase profits. The amount of the grant was based on cultivated area. The domestic price remained at $1.955 a bushel, and the government paid producers some $70 million.

July 20, 1973 - September 11, 1973

The domestic price could fall to one dollar a bushel below the international price before the government had to start paying. Otherwise, consumers were to pay the difference. This situation did not occur, however, because the international price remained above the domestic price. This time the producers subsidized consumers by $11.4 million.

international price remained above the domestic price. This time the producers subsidized consumers by $11.4 million.

7b. The Two-Price Wheat Policy was in effect from 1973 to 1979. It was created in order to protect Canadian consumers and producers from fluctuations in the international wheat price. A price range between $119.42 and $183.72 a tonne was established. During this period, the price to consumers was frozen at $119.42 a tonne. There were three possible situations that could arise:

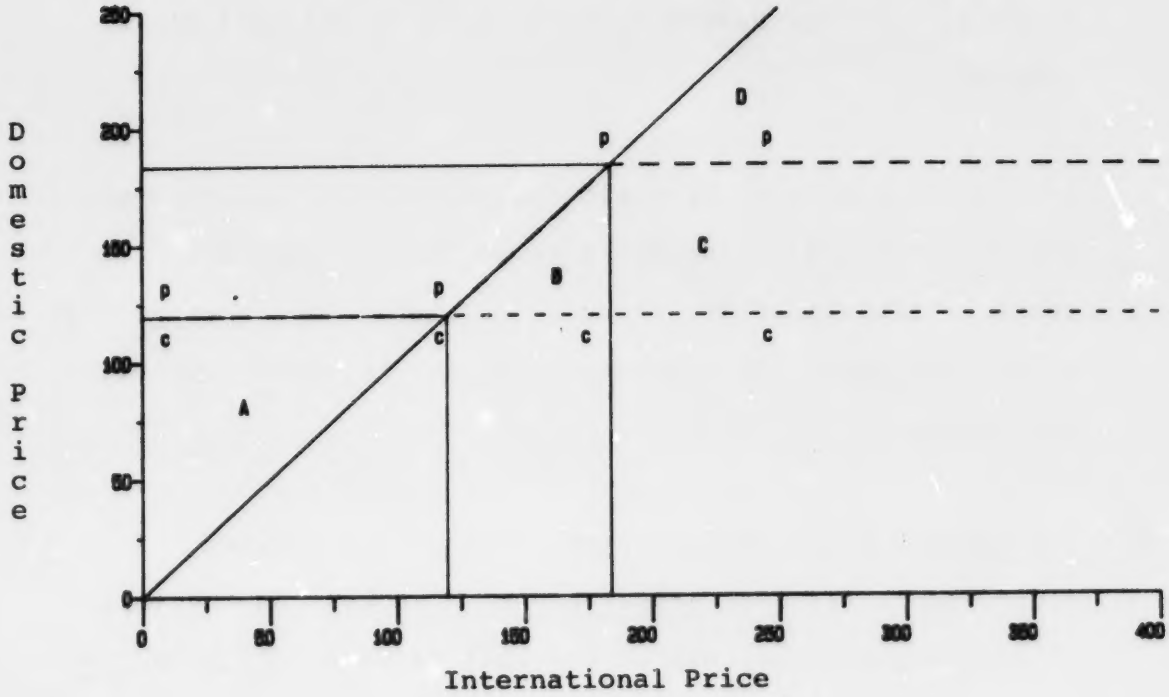
-- the international price falls below $119.42. In this case the consumer subsidizes the producer.

-- the international price stays with the $119.42 - $183.72 range. The price to producers is fixed at the international price and the difference between this and the consumer price ($119.42) is made up by the federal government. In this instance, the consumer is being subsidized by the government.

-- the international price exceeds $183.72. The producer price is fixed at $183.72. The producer is taxed on the difference between this price and the international price, and the government subsidizes the consumer for the difference between $119.42 and $183.72.

The system can be represented graphically as follows:

TWO-PRICE WHEAT POLICY (1973-79)



The price received by the producer is represented by the p series, and the consumer price by the c series. The consumer price remains at $119.42, regardless of the international price. If the international price falls below this level (the area marked A), the consumer is subsidizing the producer. If the international price remains within the specified range (marked B), the government is subsidizing the consumer. If the international price exceeds $183.72, the area marked C represents government subsidization of the consumer, and area D represents how much the government taxes the producers. During the time the program was in

force, between 1973 and 1979, the international price remained within the specified range. Thus the government subsidized consumers throughout the entire period. This range was shifted upward to reach $183.72 and $257.21 in 1980-81.

Government subsidies were eliminated in 1979, and now, when the international price falls below the minimum, the consumer subsidizes the producer and, when the international price lies above the maximum price, the producer subsidizes the consumer.

8. The Western Grain Stabilization Program was created, according to its 1981 Annual Report, "to cushion the impact of disruptive price, market and cost factors. It helps stabilize cash income from grain sales through an assured cash flow ... by guaranteeing that net cash flow from the sale of grain in any one year does not fall below the average income receipts for the immediately preceding five-year period ..." (p. 3). In a way, it is similar to the Agricultural Stabilization Program, but applied to western grain. It is voluntary, and about 75 per cent of farmers participate in the program. Since it was started in 1976, compensation payments have been required in only two years, 1977 and 1978. The program is without a doubt the most important for western grain farmers, and it will be examined in further detail in Chapter 8.

9. The last of the programs surveyed here is crop insurance. The first payments of this type were made in 1960. The total cost of premiums is split equally between the federal government and the farmers. The provinces contribute by covering the program's administration costs.

5.2.2 Provincial Programs

Keeping to the definition of western income stabilization programs established earlier, we find very few programs of this kind at the provincial level. Provincial involvement centres more on programs designed to improve credit availability, or grant programs aimed at farm improvement, disease prevention, cost reduction, and so on.

Until very recently, provincial programs were concerned mainly with emergency situations: floods, heavy crop losses, and so on. In the 1970s, income stabilization programs began to appear, such as the one in Saskatchewan for hog and beef producers and feedlot operators, which paid the following amounts:

	Hog Producers	Beef Producers	Feedlot Operators
1973-75	$14,000,000		
1980	3,460,000	---	---
1981	5,713,000	---	---
1982	1,605,000	674,000	33,035,000
1983*	998,000	849,000	9,185,000

* First two quarters.

A similar program, called the Farm Income Assurance Plan, appeared in Manitoba, which paid the following amounts:

1976	$18,357,000
1977	15,348,000
1978	7,000,000

The 1981 Drought Relief Program cost $10,423,000 and the 1982 Hog Producers Income Insurance Fund cost $5 million. The Manitoba Beef Income Assurance Plan, started in 1975, has so far cost $41 million. Finally, the Provincial Beef Stabilization Program paid out close to $21 million between September 1982 and August 1983.

At the time of writing, data available from the Public Accounts of Alberta are not sufficiently disaggregated to assess stabilization programs in that province. As in the other provinces, however, these programs are all quite recent.

5.2.3 Individual Stabilization Efforts

Because farm income instability was a fact of life long before special programs were set up to control it, Prairie farmers have coped in different ways. One avenue was the formation of pools and cooperatives. Proper land irrigation and drainage helped reduce the harmful effects of weather changes (and these techniques have always been heavily subsidized). Hardier strains of grain also helped in this regard.

Off-farm income can be considered a stabilization measure. The traditional links between farm work and the construction industry,

where work is available in the off-season, have meant that farmers have generally turned to construction or forestry jobs to supplement their incomes.

The most important stabilization measure, however, is the recognition on the part of creditors that farm incomes are unstable. It is apparently quite common on the Prairies for debt or interest payments to be halted temporarily. It does the creditor no good to panic when the farmer experiences a poor year, since he knows full well that the next year may bring a bumper crop. It sometimes happens that mortgage payments, for example, are fixed at a percentage of income.

5.3 Summary

It has been seen in this chapter how governments have been concerned about farm income instability in the West since the beginning of the century. The Second World War forced governments to undertake a series of measures designed to help farmers cope with large world surpluses. After a period of relative inactivity in the 1950s, the 1960s and 1970s saw income stabilization programs grow by leaps and bounds both at the federal and provincial levels.

At the same time, farmers themselves have continued to take concrete action to help stabilize their incomes.

CHAPTER 6: SOURCES OF INSTABILITY

6.1 Various Percentages

From this chapter onward, analysis will be concerned exclusively with the postwar period 1947-82.

The technique of component analysis, discussed in Chapter 3, is used to pinpoint the sources of instability in the farm sector. For this approach to work, however, the sum of the components must be exactly equal to the aggregate variable. Because farm income is derived from so many different sources, the most important of these must be selected. Wheat, barley, flax, and canola are used to represent grain income, since these cereals actually account for about 85 per cent of total grain revenues. Similarly, beef, veal, and pork are taken to represent cattle income, since they actually account for about 72 per cent of total cattle revenues. Finally, expenses are divided into wages, interest payments, machinery (maintenance and fuel), fertilizer, and animal feed, which altogether represent approximately 65 per cent of total expenses.

Tables 6.1 through 6.11 in the Appendix aid this analysis. These tables summarize all the information on sources of farm income instability. An understanding of the different types of percentages is crucial, and so they will each be looked at in turn.

The first percentage, marked a) on the tables, is the average annual level of instability associated with the variable. The tables in Chapter 4 dealt with this type of percentages, i.e.,

$$\frac{1}{n} \sum_{i=1}^{n} |\varepsilon_i|$$

where ε_i is the residual of the variable's growth curve.

The second percentage, marked b), is the variable's average annual level of instability as a component of the main variable. Thus,

$$B_i = \frac{1}{n} \left[\sum_{j,\, i=1} \varepsilon_j \, \theta_i \, P_i \right]$$

where ε_j represents the residuals of the component variable's growth curve

$\theta = 1$ if $\varepsilon_i > 0$,

$\theta = -1$ if $\varepsilon_i < 0$,

P_i is the proportion of the variable in the aggregate variable for each year.

The third percentage, marked c), is the contribution of the component variable to the instability of the aggregate variable, expressed as a percentage of the total, i.e.,

$$\frac{\beta_i}{\sum_{m=1}^{k} B_m}$$

where k = the number of component variables.

The fourth percentage, marked d), is the component variable's contribution to the instability of the aggregate variable in relative terms, i.e., with adjustment made for the relative proportion of the component variable in the aggregate variable, i.e.,

$$\frac{B_1/P_1}{\sum_{m=1}^{k} B_m}$$

Let us look at an example. The four percentages are listed in the following table.

Total income	=	MANITOBA	=	
		Crops		Cattle
a) 16.5		a) 24.4		a) 9.7
(16.5)		b) 13.0		b) 3.5
		c) 79.0		c) 21.0
		d) 75.0		d) 25.0

Because total income is one of the two final aggregate variables, here it is obvious that only the average annual level of instability of the variable can be determined.

The procedure is as follows. The first percentage, i.e., the variable's average annual level of instability, is weighted according to the residuals from the aggregate residuals. The residuals that do not contribute to aggregate stability, i.e., those with the opposite sign from the aggregate variable, are subtracted, leaving percentage b). The c) percentage figure of

79 per cent is arrived at as follows: 13.0 - (13.0 + 3.5). Thus 79 per cent of gross farm income instability is due to crop revenues and 21 per cent is due to cattle revenues. The information is still not complete, however, because, if it should happen that crop revenues account for 79 per cent of total income and cattle revenues for 21 per cent, then crop revenues and cattle revenues would contribute equally to farm income instability.

The actual contributions of crop and cattle revenues to total income are 55.4 per cent and 44.6 per cent, respectively. Thus

$$\frac{79}{55.4} + \frac{21}{44.6} = 1.426 + .47 = 1.8968$$

$$\frac{1.426}{1.8968} = 75\ \%,\ \frac{.47}{1.8968} = 25\ \%$$

This shows that, even if the two component variables accounted for an equal (50 per cent) share of total income, the contribution of crop revenues to aggregate instability would still be three times higher than the contribution of cattle revenues.

The aggregate variables are examined in decreasing order of importance. A component variable can itself become a new aggregate variable once the variables it comprises are defined. We proceed in the following order, each step corresponding to the table of the same number:

6.1 Total income = Crop revenues + Cattle revenues

6.2 Expenses = Wages + Interest + Machinery + Fertilizer + Animal feeds

6.3 Crop revenues = Wheat revenues + Barley revenues + Flax revenues + Canola revenues

6.4 Cattle revenues = Beef revenues + Veal revenues + Pork revenues

6.5 Wheat revenues = Production x Price; Yield and Acreage

6.6 Barley revenues = Production x Price; Yield and Acreage

6.7 Flax revenues = Production x Price; Yield and Acreage

6.8 Canola revenues = Production x Price; Yield and Acreage

6.9 Beef revenues = Slaughter x Price

6.10 Veal revenues = Slaughter x Price

6.11 Pork revenues = Slaughter x Price

The aggregate variables on the left reappear on the right as component variables. In order to keep the number of tables to a minimum, the component variables of production (cultivated acreage and yield) have been included on the same table as barley, flax, and canola revenues. Tables 6.3 and 6.8 include data on canola; these are only available from 1958.

6.2 Observations

Before proceeding to an analysis of the results, several observations should be made:

-- The results on stability from this analysis and the results described in Chapter 4 cannot be compared. In the latter

case, total income is aggregated (i.e., not broken down by farm), since data on farms producing a particular agricultural commodity are divided into mutually non-exclusive categories. The foregoing problem arises because many farms produce several different agricultural commodities, and in terms of both number and output their contribution to total farm production cannot be ignored. In addition, so far as crops are concerned, the number of farms producing this or that type of grain can vary considerably from year to year. Data are derived from the farm census and are only updated every five years. Using standard methods and annual data to construct a complete vector would produce inaccurate results.

-- The results of aggregate variables cannot be compared when they are treated as component variables. Crop revenues as shown on Table 6.1, for example, reflect income from all crop sales, while crop revenues according to Table 6.3 are calculated by taking the sum of the listed crops. This is also true of the wheat income figures shown on Table 6.3; they cannot be compared with those given on Table 6.5 because the former figures include stocks (derived as they are from wheat sales). As mentioned earlier, disaggregated variables make up the major part of the aggregate variable (between 80 and 85 per cent).

-- Because of the methodology adopted, the percentages marked c) and d) must add up to 100 when added horizontally, and it is taken for granted that the b) percentages are equal to the a) percentages in the aggregate variable (a margin of error is assumed). The result of adding together the percentages of the component variables is given in parentheses under the aggregate variable a) percentage, and, in the case of production, is noted in parentheses just after the percentage figure.

-- Assuming no bias, the d) percentages should be divided equally between the variables.

-- In the case of Tables 6.5 through 6.11, the d) percentages are not given. The reason is that the aggregate variable is obtained by multiplying the components, not by adding them, meaning that the individual contributions of the components to the aggregate variable cannot be calculated.

-- Because the price of beef, veal, and pork is the same everywhere, the a) percentage is the same from one province to another.

6.3 Interpretation of Results

In the interest of brevity, we will use the d) percentages from the first four tables and the c) percentage from the other tables in our description and interpretation of the results, since these percentages will yield the most information.

As shown in Table 6.1, the contribution of crop farming revenues to farm income instability is three times greater than cattle farming revenues in all three Prairie provinces. This means that incomes from farming operations based on crop farming are intrinsically more unstable than those derived from livestock-based operations.

As far as expenses are concerned (shown in Table 6.2), in contrast to the expected 20 per cent, animal feed makes a relatively high contribution to expense instability and again this is true in all three provinces. This demonstrates the importance of feed grains in the food chain.

Knowing that crop farming involves a high risk of instability, the question arises: is there a particular crop that is responsible for a major part of this instability? Table 6.3 shows that this is true in Saskatchewan and Alberta but not in Manitoba. In Manitoba, the various cereal crops all contribute about equally to crop revenue instability. In the other two provinces, however, flax and canola actually contribute to the <u>stability</u> of crop

revenues. It will be seen further on that cultivated acreage for both of these crops is very unstable, which would indicate that there is a degree of substitution, the choice being made between wheat or barley on the one hand and flax or canola on the other, depending on the price set by the CWB prior to planting time. This would explain why the first group of grains follows the cycle of overall instability, while the latter group runs counter to this trend.

As far as cattle are concerned, Table 6.4 demonstrates that in Alberta the cattle revenue variable shows less instability than in the other two provinces. The contribution of beef revenues to aggregate instability, however, is the same as in the other provinces, and the veal revenues variable is even higher in Alberta. This discrepancy may be due to the fact that even though the livestock producer in Alberta knows that there is a market for his veal, his calf herd only becomes valuable when it is "converted" into beef. Since Alberta is the major Prairie beef producer, veal revenues are indirectly tied to the beef cycle. This explains the gaps in the d) percentages between provinces, as well as the greater correspondence between percentages for beef and veal revenues in Alberta compared with the other provinces.

We now turn our attention to the disaggregation of crop revenues, as shown in Tables 6.5 through 6.8. Note that the disaggregated variables are multiplied together, not added. The first two columns of the table list the disaggregated variables

that make up income (production x price) and the last two columns list the variables that make up production (yield x cultivated area). Now we are ready to examine the results.

The results shown in Table 6.5 indicate that in the case of wheat the price contributes just as much as production to income instability. Thus efforts to reduce income instability must be aimed as much at the one as at the other. Production is composed of two distinct variables. Yield, on the one hand, is something over which the farmer has little control (in fact, in the short term, he has no control at all). Cultivated area, on the other hand, is entirely dependent on human decision, whether emanating from the farmer, a marketing board or the government.

In the following table, data from Table 6.5 has been divided into two periods: 1946-63 and 1963-80.

		1946-63	
	Production	Acreage	Yield
Manitoba	a) 16.8	a) 9.3	a) 15.9
	(16.8)	b) 4.1	b) 12.7
		c) 24.0	c) 76.0
Saskatchewan	a) 28.5	a) 6.2	a) 25.7
	(28.6)	b) 2.9	b) 25.7
		c) 10.0	c) 90.0
Alberta	a) 15.9	a) 7.2	a) 15.4
	(16.0)	b) 0.6	b) 15.4
		c) 4.0	c) 96.0

1963-80

	Production	Acreage	Yield
Manitoba	a) 18.9	a) 14.3	a) 9.4
	(18.9)	b) 12.5	b) 6.4
		c) 66.0	c) 34.0
Saskatchewan	a) 17.1	a) 13.9	a) 13.8
	(17.1)	b) 7.9	b) 9.2
		c) 46.0	c) 54.0
Alberta	a) 19.2	a) 17.0	a) 6.4
	(19.1)	b) 16.8	b) 2.3
		c) 88.0	c) 12.0

In the 1946-63 period, yield was by far the main source of wheat production instability. More recently, the situation has reversed, and variation in cultivated area has been mainly responsible for wheat production instability. This is an important point: the relative stability seen over the last 20 years in wheat production is the result of stable yields, and any disruption to yield stability will cause income instability to rise sharply. In the case of Saskatchewan, this has led to a drop in wheat production instability from 28.5 to 17.1 per cent. A reversal of the relative contributions of yields and cultivated area has also been seen in the other provinces over this period. The point bears repeating: the fact that wheat production has been stable over the last 20 years is largely due to luck, and there is a strong risk of substantially more instability arising in the future.

The three other crops besides wheat will be analysed together, since their characteristics are similar. First, production

accounts for an important part of income instability, generally over two-thirds, and, second, cultivated area is easily the main component of this production instability. This is not surprising, since each spring farmers elect to plant the crop with the highest quoted price from the Canadian Wheat Board. Caution must therefore be exercised in the interpretation of results, since it is the price of the commodity that ultimately determines everything else. Income for these three crops are highly unstable in all three provinces. It must be remembered that such instability is not an inherent characteristic of barley, flax and canola, but is caused by substitution decisions on the part of the producer as he tries to maximize his income from one year to another.

The same is true of cattle revenues. Interpretation of the results is difficult because of the cattle cycle, which links slaughter to price. For example, in Alberta, 58 per cent of cattle revenue instability can be attributed to slaughter and 42 per cent to price. It is possible, however, to show that price is dependent on slaughter, and also that slaughter is dependent on price. This is equally true of hog and calf production, and the veal is directly linked to beef prices. The results shown on the three tables must therefore be analysed with care.

CHAPTER 7: ECONOMIC CONSEQUENCES - A PRELIMINARY EXAMINATION

The same technique whereby an aggregate variable is broken down into component variables can also be helpful in measuring the impact of farm sector instability on the economy as a whole. Data on total provincial income are available from 1926 to 1981 in the form of data on personal disposable income, disaggregated by employment earnings, net income of farming operations from agricultural production, net income of individual non-farm businesses, interest dividends, investment income, and government transfer payments. Note that this disaggregation does not include the before-tax profits of corporations.

This latter statistic is available from 1961 onward in calculations of net provincial income at factor cost. This variable is disaggregated by employment earnings, before-tax profits, interest and investment income, net income of farming operations from agricultural production, and net income of individual non-farm businesses. The difference between the two series thus lies in the fact that the 1946-82 series (used in this paper) includes government transfer payments and excludes before-tax profits of corporations, and the 1961-81 series does exactly the opposite. The results of the two series are presented in Tables 7.1 and 7.2.

It can be seen from Table 7.1 that in the Prairie provinces two-thirds of personal disposable income instability can be attributed to farm income. For Canada as a whole, the figure is 52 per cent. The absolute contribution varies significantly from one province to another and for Canada as a whole, so that the contribution of farm income to personal disposable income in each province is a very important consideration. A farm-sector-based economy will thus be inherently more unstable than another based on a different economic activity. This explains why personal income instability is 11.5 per cent in Saskatchewan but only 5.4 per cent in Manitoba; the farm sector is a much less important part of the Manitoba economy than it is in Saskatchewan.

Table 7.2 gives a disaggregation of net provincial income at factor cost. The two differences between this table and Table 7.1 are the replacement of transfer payments by company profits and the shorter time period. The relative contribution of farm income to instability of net provincial income fell from 68 to 66 per cent in Manitoba and from 68 to 58 per cent in Saskatchewan. In Alberta and Canada as a whole, however, there was a dramatic drop in this statistic from 63 to 31 per cent and 52 to 34 per cent, respectively. Natural resource price increases during the 1970s may be a partial cause of this phenomenon. As a result of these changes, the growth curve over the entire period had to be readjusted for all components except farm income.

An analysis of Table 7.2 shows that the relative contribution of farm income to net provincial income is two-thirds in the case of Manitoba and Saskatchewan, and one-third in Alberta and Canada as a whole. The fact that livestock accounts for much of Alberta's farm sector activity, as opposed to the other Prairie provinces where grain remained most important during the study period, certainly has something to do with the fact that the contribution of farm income to instability is greater in these provinces than in Alberta.

These results indicate, then, that farm income is a major contributor to aggregate income instability in the economy. In the case of Alberta and Canada as a whole, its impact has lessened significantly over the last 20 years.

The next step is to analyse employment instability, broken down into farm income and non-farm income. Note that we are dealing here with total employment, meaning that self-employed contractors, family employees, and so on are included. Total employment covers more than just salaried employees. Unfortunately, there is a major problem here with the available data: they are only available from 1966 onward, a very short time period. The results are listed in Table 7.3. Analysis of the instability levels of the two groups reveals that farm employment is clearly more unstable than non-farm employment. As well, the relative contribution of farm employment to total employment instability

works out to 40 per cent in Saskatchewan and Manitoba, 58 per cent for Canada as a whole, and zero in the case of Alberta. In the latter instance, analysis of the residuals reveals that the highest non-farm income residuals are found in the 1970-75 period, and that these are negative. Thus the regression compensated for employment growth in the non-farm sector towards the end of the period. As we have already seen, natural resource activity increased in the mid-1970s. This may represent a plausible explanation for the situation, although it is not applicable to Canada as a whole since the Canadian economic base is much more diversified.

The brief chapter has tried to gauge the impact of farm sector instability on the economy, however incomplete such an examination may be. A more exhaustible analysis would have to take into account the multiplier effects of the farm sector on the economy. Further study in this area is certainly needed.

CHAPTER 8: EFFICACY OF PROGRAMS

8.1 An Ambitious Title

The following table lists the levels of average annual instability of realized net income per farm, first with and then without the assistance of the following programs and agencies: Crop Insurance, Canadian Dairy Commission, Agricultural Stablization Board, Prairie Farm Assistance Act, Compensation for Animals Slaughtered, and Quality Premiums. The LIFT Program and Western Grain Stabilization Program have been left out, since in their data the three provinces are not differentiated.

	Manitoba	Saskatchewan	Alberta
With	24.3	26.9	18.8
Without	23.2	26.3	17.8

It can be seen that these programs have had but little impact on income instability. But why? The answer is that these programs represent but a tiny fraction of government efforts to stabilize the farm sector. For example, one might ask whether these programs have had a greater impact on farm income instability than the Canadian Wheat Board, which lends money at preferential rates to countries that buy Canadian grain. This question is difficult to answer, but leads to another question that is perhaps easier to answer -- have the programs discussed in Chapter 5 had a greater

stabilizing effect than the combined influence of all existing laws, programs, policies, boards, and so on that are aimed at the farm sector? The answer to this question, obviously, is no.

These programs account for 10, 6, and 12 per cent of realized net income in Manitoba, Saskatchewan, and Alberta, respectively. It must be realized that this is a very rough estimate, since subsidies from these programs are not equally divided among producers. If these figures are compared with those given in the table above, they seem quite high. In Alberta, for example, subsidies on average have boosted realized net income per farm by 12 per cent over the 1961-81 period, while reducing instability by only 1 per cent. Again, these figures are only rough estimates. These figures actually contain a significant bias, since the stabilizing effects of subsidies <u>for a particular producer</u> also enter into the calculation of average values.

In order to assess the impact on income stability of government intervention in the farm sector, two scenarios must be compared: one where there is government intervention (the real world), and one where these is no government intervention. By comparing instability rates in each of these scenarios, an accurate picture of the impact of such programs can be drawn. A cost-benefit analysis can also be carried out to gauge the effects of intervention on the economy as a whole, as long as we include in costs any distortions in the resource allocation and, in the

benefits (costs), the increase (decrease) in the consumer's welfare as a result of more (less) stable prices for agricultural commodities.

As might be expected, this kind of research is beyond the scope of this chapter. Several authors have made attempts based on various assumptions to measure the rate of protection of various agricultural commodities in different countries. These rates vary widely depending on the product, the country and the particular year. Rates can even vary within a particular grain category, for example. Nevertheless, protectionism and government intervention is rife in the farm sector, even if it is not always obvious. For example, the United States recently extended credit of $250 million to Egypt to enable it to buy 1½ million tonnes of wheat. The term of this loan was 40 years, with no interest to be paid for 10 years and a rate of 2 or 3 per cent fixed for the remainder of the term.

8.2 A Particular Instance: The WGSP

The remainder of this chapter will be devoted to a more in-depth examination of a program which our research indicates is most likely to solve the income instability problem for western grain producers; namely, the Western Grain Stabilization Program (WGSP). This program is unlike any other in Canada because it takes into

consideration not only prices, but also sales volumes. By basing its compensation payments on net cash flow, it can protect the producer against fluctuations in sales, whether caused by variation in yields, demand, input costs, of his ability to deliver the product. Grains covered by this program include: wheat, oats, barley, rye, flax, canola, and mustard seed.

The methods used to calculate total compensation payments and their distribution, as well as the relative contributions of producers and the federal government, are described. Calculation of total payments is explained below, using dummy figures (in millions of dollars).

A payment is due when Net Cash Flow falls below its average value for the five prvious years (when Item 9 - Item 8 is positive as in example a) below; a negative result as in example b) results in no payment). Participating producers received $115 million in 1977 and $253 million in 1978.

[1] Gross commercial sales ($)	[2] Gross grain expenses ($)	[3] Proportion of expenses involved in grain sales (%)	[4] Expenses eligible for program ($)
2,500	1,400	75	1,050

[5] Net income ($)	[6] Ceiling on total sales (%)	[7] Eligible producers (%)	[8] Net cash flow ($)
1,450	85	90	1,109

[9] Average net cash flow ($)	[10] Potential payment ($)	[11] Participating producers (%)	[12] Amount of payment ($)
a) 1,400 b) 1,000	a) 291 b) -109	75	a) 218 b) ---

Item 1 Total commercial grain sales
Item 2 Total gross expenses related to grain
Item 3 Proportion of total gross expenses involved in selling grain
Item 4 Expenses eligible for the WGSP (Item 3 x Item 2)
Item 5 Net income (Item 1 - Item 4)
Item 6 Sales (not to exceed the ceiling of $60,000 per farm) divided by total sales
Item 7 Proportion of producers eligible to participate in the program
Item 8 Item 5 x Item 6 x Item 7
Item 9 Average net cash flow over last five years (two examples given)
Item 10 Item 9 - Item 8
Item 11 Proportion of participating producers
Item 12 Amount of payment, if any (Item 11 x Item 10)

The payments are divided as follows: the total contributions of the producer for the last three years are divided by the total contribution of all producers for the same years. The result is the producer's share of program payments.

The contributions required are calculated as follows: 2 per cent of the producer's grain sales under $60,000 (maximum contribution of $1,200). The contribution of the federal government is the producer percentage plus 2 per cent. If for two consecutive years interest income from the fund accounts for more than one-third of total contributions, then the producer's contribution drops to 1½ per cent and that of the federal government to 3½ per cent. If this situation continues for four years, these rates drop to 1 and 3 per cent, respectively. In fact, such a situation occurred in the past two years, and since January 1984 the producer contribution has been pegged at 1½ per cent and the federal government contribution at 3½ per cent. The percentage participation of eligible producers has been quite stable at about 75 per cent.

The essential features of the WGSP have now been discussed: the calculation of payments, their distribution, and the way program costs are divided between the federal government and participating producers. It remains only to examine the program's financial statements since it started in 1976.

	Contributions ($ millions)		Payments ($ millions)
	Government	Producers	
1976	45.3	22.7	
1977	58.5	29.2	115
1978	57.1	28.6	253
1979	77.3	38.6	
1980	97.6	48.8	
1981	113.1	56.6	
1982	110.8	55.1	
1983*	125.7	63.1	
Total	685.4	342.7	368

* as of September 30.

Total interest income amounts to $187 million. As of September 30, 1983, funds totaled $814 million (excluding administrative costs, salaries, etc.). It can safely be said that western grain farmers are very well protected from excessive fluctuations in their net incomes. The program can be considered a form of income stabilization insurance. It could be entirely financed by producers, those who are least inclined to take risks. In this case, federal participation would no longer be required. This point will be discussed in greater detail later in this chapter.

One of the main criticisms leveled at the program is that it makes no allowance for inflation. The table below shows the compensation payments that would have been made under inflation indexing (using the Consumer Price Index as the deflator).

Compensation Payments
(Millions of 1981 dollars)

1976	145
1977	648
1978	911
1979	449
1980	76
1981	-
1982	149
Total	2,378

In constant dollars, compensation payments would have totaled $2,378 million. As noted earlier, $368 million has actually been paid out under the WGSP, the equivalent of $511 million in constant dollars. The conclusion is obvious: under inflation

indexing, payments would increase substantially. In order to maintain an adequate level of funds, WGSP premiums would also have to rise proportionately.

Another ways to analyse this program is to assess the gross income path necessary to bring the average net cash flow of the preceding five years equal to that of the year in question (the current NCF is not included in the calculations, and averages are calculated for each year individually). We are interested in how much further incomes would have had to drop (or expenses increase) before farmers would have been eligible for compensation payments. In the the table below, the figures on the left are in current dollars and those on the right in constant dollars (indexed for inflation).

	Millions of current dollars	Millions of 1981 dollars
1976	-262	+236
1977	+200	+1062
1978	+484	+1508
1979	-120	+780
1980	-632	+144
1981	-1195	-269
1982	-647	+307

For example, if in 1976 lower incomes and/or higher expenses had resulted in at least a $262 million difference, compensation payments would have been made. On the other hand, if in 1977 higher incomes and/or lower expenses had resulted in at least a $200 million difference, no payments would have been made.

Compensation payments made in 1977 and 1978 covered 58 per cent (115/200) and 54 per cent (263/484) respectively of farmers' foregone earnings. Considering that all surpluses remain the property of farmers and that the federal government contributes two-thirds of the funds (and producers only one-third), these figures appear high enough to prevent those farmers who are wary of risks from leaving the market. There is another point that should be made about compensation payments. All things being equal, if prices decline regularly for several years in a row, the WGSP can become more of a subsidy program than a stabilization program, since payments will be made regularly every year. In this case, the average NCF for the five preceding years would always be higher than the NCF of the year in question. Sales volumes are difficult to predict, and so it is impossible to say what price levels might lead to such a situation; nevertheless, it is a possibility.

Is the intervention of the federal government in this area justified then? Its role in financing the WGSP is based on government policy, which is to support the family farm as the basic unit of Canadian agriculture (or at least to prevent its demise). This is the rationale behind all farm programs. Given that grain farming is a high-risk business (particularly with respect to international trade), the economic justification for federal government intervention is to ensure that western farmers do not suffer in relation to farmers in other areas because of their specialization. Risks should be shared. Consequently,

information on how program benefits are distributed among all Canadians would be needed before a complete analysis could be attempted. The problem is extremely complex, however.

There are two other issues connected with the WGSP: first, the extent of federal government participation in the program; and second, the complete absence of provincial government funding. These two questions, however, lie outside the economic perspective adopted by this study.

It can certainly be said that this program is unique in Canada, since there is no other program that guarantees the net income of producers of a particular commodity. According to an internal Agriculture Canada document, as a result of payments made in 1977 and 1978, net cash flow instability was reduced from 9.6 to 6.3 per cent a year between 1976 and 1981. The nature of the program is such that it has great potential for stabilizing grain farmers' incomes, and figures confirm that it is doing the job. More time will be needed before this can be stated with certainty, but there seems to be little doubt. The WGSP is unquestionably the most important program of its kind in terms of protecting net income and providing assistance when times are bad. The program insulates grain producers from sudden dips in cash flow, while allowing them to benefit from any increases.

CHAPTER 9: SUMMARY AND CONCLUSIONS

This study began with a review of previous research on farm income instability on the Prairies. The concept of measuring instability on the basis on deviations from a growth curve was introduced. The results of this first stage of our investigations can be summarized as follows: 1) Saskatchewan experiences the highest levels of farm income instability; and 2) the instability of farm variables has been on the decline since 1926, with the exception of the price of wheat, which has become increasingly unstable since the war.

Using a technique known as component analysis, it was discovered that three-quarters of farm income instability can be linked to crop farming, and that this is true in all three provinces. Disaggregating crop revenues, it can be seen that instability in wheat sales is the result of fluctuations in both wheat production and price. In the case of other crops (barley, flax, and canola), the main source of instability is cultivated area. Wheat is the most important crop grown in Canada, and 50 per cent of wheat production is exported. For these reasons, the price-fixing mechanisms of the international market were examined. This analysis showed that, as a result of national stabilization programs, the stability of the domestic market tends to rely more on import and export levels than on prices. The international market is thus very volatile and subject to dumping on the part of

both producing and consuming countries. Coupled with the inelasticity of supply and demand curves, this leads to wide price swings. The massive entry of the U.S.S.R. into the international wheat market as an importer in 1973 is the best example to date of the kind of shocks to which the market is prone.

As far as wheat production instability is concerned, it was found that yields during the 1946-80 period were the main source of instability. However, by dividing this period in two, it could be seen that there were actually two opposing trends: in the first part of the period (1946-63), yields represented virtually the only source of production instability, whereas in the second part (1963-80), cultivated area was the main source and yields were very stable. This point is important and will come up again later.

As for cattle, it was revealed that the incomes of livestock producers were more stable than those of grain farmers, and that in their case instability was linked to the relationship between production and price in the cattle production cycle.

After describing the major programs aimed at stabilizing farm incomes on the Prairies, one program in particular was singled out for more detailed examination -- the Western Grain Stabilisation Program (WGSP). This program was judged to offer the most in terms of protection and assitance. While recognizing that the

amounts paid out under this program are substantial, it was pointed out that this program is the only one of its kind in Canada.

Several conclusions can be drawn from the results of this research. First, the main source of income instability for western grain farmers is the price of wheat as set by international markets. Second, grain farmers have been doubly lucky over the past 20 years, benefiting in the first place from a stable international wheat price up until 1973, followed by skyrocketing prices and increased revenues for grain producers, and benefiting in the second place from very stable yields since the year 1960s. The simultaneous appearance of these two phenomena -- stable yields coupled with substantial increases in revenues -- represents in fact the exception rather than the rule. The chances of this situation recurring in the future, however, are very slight. The observations that follow are based on this assumption.

Efforts to reduce farm income instability in the West must consider first of all the international wheat price. When this price is stable, not only are grain farmers' incomes more stable, but the costs to livestock producers also exhibit greater stability. It cannot be emphasized too strongly that the international wheat price is the cornerstone of farm income stability on the Prairies. This objective can perhaps be achieved by entering into bilateral and multilateral agreements with both importing and

exporting countries, or by concluding an international wheat price agreement, such as that which was in effect between 1949 and 1973. This type of agreement enables wheat inventories to be used as a buffer against excessive price fluctuations.

The first of these two options continues to be followed by the Canadian Wheat Board. It has already been noted that the United States frequently extends credit at preferential rates to countries willing to enter into long-term wheat purchasing agreements. Canada, too, uses this tactic to maintain its competitive edge on the international wheat market against rivals such as the United States, Australia, and Argentina.

Nevertheless, in the long run the interests of all exporting countries, Canada included, will best be served by concluding an international wheat price agreement. This goal is not likely to be attained in the near future, however, and may well be wishful thinking. In the meantime, whether or not this comes to pass, some observations on the situation can be made. First of all, the existence of the Western Grain Stabilization Program is reassuring, because this program is highly effective, and the wide fluctuations of recent years should no longer appear. However, a steady decline in wheat prices on international markets would still have serious consequences for western farmers. It is possible that in such circumstances the program may not generate sufficient funds to finance itself. Even so, the minimum price

set by the "Two-Price Wheat Policy" should stave off disaster, by having consumers in effect subsidize grain producers. The combination of these two programs thus ensures a certain degree of stability and an adequate level of income.

Second, faced with the possibility of greater yield instability in the future, it is recommended that research and development continue to be aimed at the development of crops more resistant to natural catastrophe, particularly drought-resistant strains of wheat. Drought is a threat that constantly hands over the Prairie provinces. Another recommendation related to the preceding point is that priority must be given to irrigation projects. These is no question that there is a connection between high temperatures, soil moisture loss, and poor harvests. In this context, controlled irrigation can represent a bulwark against periods of drought. Similarly, land drainage projects can help reduce the damage caused by excessive rainfall.

If measures such as the above are undertaken without delay, farm income instability for western farmers may not increase as much as might be expected in the next few years.

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AJAE: American Journal of Agricultural Economics
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APPENDIXES

Table 4.1

Farm Sector

	Realized gross income by farm (1926-81)	Realized net income by farm (1926-81)	Expenses by farm (1926-81)	Wheat		Beef	
				Yield (1914-80)	Price (1914-80)	Slaughter (1940-82)	Price (1930-82)
	Annual growth rate (per cent)						
Manitoba	3.9, (.85)	3.2, (.89)	4.1, (.91)	1.0, (.43)	-0.5 (.05)	1.1, (.27)	
Saskatchewan	4.0, (.77)	5.0, (.81)	3.6, (.89)	1.1, (.24)	-0.3 (.01)	2.7, (.65)	1.6, (Win.)
Alberta	3.8, (.85)	3.5, (.40)	4.3, (.93)	1.0, (.28)	-0.3 (.02)	6.4, (.93)	
Canada	4.3, (.92)	3.6, (.64)	4.7, (.96)	1.4, (.46)	-0.4 (.03)	3.1, (.92)	1.1, (Tor.)
	Average annual instability (per cent)						
Manitoba	22.4	38.6	15.9	16.7	26.6	17.1	
Saskatchewan	27.5	60.9	15.7	27.9	28.1	17.6	16.8
Alberta	20.8	47.2	14.5	23.5	28.3	17.9	
Canada	16.9	32.8	12.4	18.8	27.6	9.5	13.3

Dummy variables have been introduced for Manitoba (1931-82) and Saskatchewan (1931-32-33) to compensate for negative incomes in those years. If these variables are used for Alberta as well, the average annual instability for this province works out to 33.4 per cent rather than 47.2 per cent.

Table 4.2

Economy As A Whole

	Per capita income (1926-81)	Employment* (1953-82)	Unemployment rate* (1951-82)	Employment earnings (1947-81)	GDP (1961-81)	Net provincial income (1961-81)
			Annual growth rate (per cent)			
Manitoba	2.9 (.93)	1.8 (.99)	10.7 (.53)	3.6 (.97)	3.7 (.96)	3.8 (.96)
Saskatchewan	3.6 (.80)	1.5 (.90)	9.9 (.59)	4.8 (.98)	4.7 (.90)	4.9 (.85)
Alberta	3.1 (.88)	3.8 (.98)	9.7 (.41)	4.5 (.98)	5.9 (.97)	6.3 (.97)
Canada	2.9 (.95)	2.5 (.99)	15.2 (.61)	3.7 (.98)	3.8 (.98)	4.1 (.98)
			Average annual instability (per cent)			
Manitoba	10.4	1.6	.723**	4.6	3.3	3.2
Saskatchewan	22.2	3.4	.578**	6.3	7.6	10.2
Alberta	13.8	3.9	.888**	5.2	5.2	5.2
Canada	8.4	2.6	1.072**	4.4	2.6	2.6

* From 1951 to 1965, figures only include those aged 14 and over. As of 1966, figures include only those aged 15 and over. For the purposes of employment and unemployment statistics, this discrepancy is negligible.

** Because the unemployment rate is represented by a percentage, gaps are given in percentage points. Thus the table indicates, for example, that the Canadian unemployment rate varied by 1 percentage point around its growth curve (and not by 1 per cent).

Table 4.3

Instability Over Time and Annual Average Instability Rates

	Realized gross income by farm	Realized* net income by farm	Expenses by farm	Wheat		Beef	
				Yield	Price	Slaughter	Price
			1926-81 period				
Manitoba							
1926-45	31.2	53.3	17.0	21.6	34.6		
1946-81	17.5	30.5	15.3	12.1	19.2		
Saskatchewan							
1926-45	45.0	104.0	20.5	35.4	37.2		
1946-81	17.7	36.7	13.1	21.0	20.0		
Alberta							
1926-45	33.6	51.9	18.7	34.2	37.2		
1946-81	13.7	23.9	12.2	13.7	20.2		
			1946-81 period				
Manitoba							
1946-63	21.3	27.0	13.3	15.3	14.1	12.6	
1964-81	14.2	25.6	13.0	9.8	23.8	12.6	
Saskatchewan							
1946-63	17.8	25.9	8.6	25.3**	15.1	20.9	13.4 (Win.)
1964-81	15.2	28.8	10.0	13.1	24.7	7.4	10.1
Alberta							
1946-63	15.3	20.2	8.4	16.1	15.4	15.4	
1964-81	12.3	19.6	8.5	6.8	24.5	13.9	

* Dummy variables have been introduced for the years 1931-32-33 in the case of Saskatchewan and Alberta, and for the years 1931-32 in the case of Manitoba.

** If the 1961 drought is excluded, the rate works out to 20.7 per cent.

List of Programs

	Prairie Farm Assistance Program*			Compensation for Animals Slaughtered			Quality Premiums for Cattle		
	Thousands of dollars								
	Man.	Sask.	Alta.	Man.	Sask.	Alta.	Man.	Sask.	Alta.
1946	115	12276	4093	17	3	-	1284	922	2183
1947	12	9138	1768	18	4	2	484	297	761
1948	433	13212	3149	40	2	1	527	339	850
1949	119	11965	2771	51	4	8	348	182	647
1950	283	15367	5807	63	13	10	381	183	622
1951	251	5037	3623	125	12	21	363	172	597
1952	312	1913	1960	271	386	26	436	211	607
1953**	224	1834	2096	108	179	28	625	266	921
1954**	530	1125	1091	51	41	19	426	191	837
1955	1720	12542	3768	23	21	30	531	232	937
1956	5115	10201	3067	27	21	114	685	284	992
1957**	1352	1050	1117	13	40	10	593	281	946
1958	1002	14761	7292	12	66	16	852	426	1191
1960	1036	11637	5035	234	315	161	923	490	1365
1961	953	8043	6805	505	276	140	671	390	1031
1962	7320	26864	10170	591	303	279	874	522	1420
1963	789	6609	7313	199	283	207	553	288	1207
1964	2981	1224	5839	130	165	327	733	331	1403
1965	472	7133	2979	49	62	99	893	464	1629
1966	501	2154	4315	41	86	40	824	434	1669
1967	371	1141	1921	34	82	19	55	779	834
1968	173	5874	2598	54	54	24	1009	593	1784
1969	297	5172	1329	40	103	34	590	369	1265
1970	650	1555	1844	82	121	28	241	187	400
1971	995	1138	4746	64	218	40			
1972	274	1217	3234	79	205	37			
1973	195	1466	1432	127	505	109			
1974	1	32	2334	288	717	488			
1975	-	-	267	854	703	1345			
1976				959	1096	934			
1977				689	528	1329			
1978				409	582	1156			
1979				421	350	982			
1980				1025	121	358			
1981				479	21	331			
1982				43	16	111			

* The program started in 1939; farmers have contributed $206,314,000 and the federal government $191,398,000.

** Years for which the program had no deficit.

List of Programs (continued)

	Two-Price Wheat Policy	Lower Inventories for Tomorrow			Western Grain Stabilization Program
		Thousands of dollars			
		Man.	Sask.	Alta.	
1970		6 115	42 106	14 396	
1971					
1972					
1973	63 173				
1974	69 386				
1975	78 671				
1976	188 698				
1977	65 303				115 000
1978	21 860				253 000
1979	43 826				
1980					
1981					
1982					

	Canadian Dairy Commission			Agricultural Stabilization Board		
	Thousands of dollars					
	Man.	Sask.	Alta.	Man.	Sask.	Alta.
1959				-	-	-
1960				657	144	2032
1961				991	264	2362
1962				508	159	1535
1963				546	163	1628
1964				2894	3244	4918
1965				2700	2761	4503
1966				4206	3015	7244
1967				5863	3396	11675
1968	4009	3736	7927	1609	406	3619
1969	4808	4259	9276	1461	159	3014
1970	3978	3219	7668	735	131	1704
1971	3485	2804	6713	283	76	577
1972	3605	2819	7076	2084	1884	2447
1973	3914	3012	7846	867	820	2374
1974	5874	4208	10781	-	-	1
1975	9467	5745	15999	5905	3021	17571
1976	9774	5532	16704	1166	2052	4480
1977	9990	5887	17566	1097	1434	5314
1978	10149	6137	16507	6875	12610	26890
1979	10213	6422	17258	140	339	-677
1980	10414	5910	15742	646	2	602
1981	10350	6900	17263	4049	2159	5368
1982	10092	6829	17946	10025	6124	13175
				55307	44363	123710

List of Programs (continued)

	Crop Insurance Thousands of dollars		
	Man.	Sask.	Alta.
1959	-	-	-
1960	61	-	-
1961	109	7	-
1962	156	43	-
1963	203	70	-
1964	228	69	-
1965	312	73	55
1966	422	182	200
1967	641	314	637
1968	716	560	1119
1969	641	430	986
1970	495	193	726
1971	653	260	727
1972	2019	6515	3864
1974	2765	14578	7300
1975	4419	19739	14795
1976	5271	24400	16548
1977	8454	36245	16827
1978	8257	33170	19478
1979	8494	34120	20972
1980	9852	42241	27259
1981	11234	52867	31818
1982	13012	56003	37111

Total federal government contributions towards premiums and administrative costs of Crop Insurance Program ($000)

Administrative costs		Premiums	
Manitoba	2986	Manitoba	79083
Saskatchewan	1350	Saskatchewan	323297
Alberta	1826	Alberta	201125

Table 6.1

	Total revenues	Crop revenues	Cattle revenues
Manitoba	a) 16.5	a) 24.4	a) 9.7
	(16.5)	b) 13.0	b) 3.5
		c) 79.0	c) 21.0
		d) 75.0	d) 25.0
Saskatchewan	a) 17.1	a) 21.3	a) 12.2
	(17.1)	b) 15.6	b) 1.5
		c) 91.0	c) 9.0
		d) 77.0	d) 23.0
Alberta	a) 14.1	a) 24.2	a) 8.9
	(14.2)	b) 11.0	b) 3.2
		c) 77.0	c) 23.0
		d) 78.0	d) 22.0

Table 6.2

	Expenses	Wages	Interest	Machinery	Fertilizer	Animal feeds
Manitoba	a) 13.4	a) 10.6	a) 13.4	a) 6.6	a) 33.4	a) 27.7
	(9.9)	b) 1.4	b) 1.1	b) 2.1	b) 1.5	b) 3.8
		c) 14.0	c) 11.0	c) 21.0	c) 15.0	c) 38.0
		d) 17.0	d) 13.0	d) 7.0	d) 24.0	d) 38.0
Saskatchewan	a) 9.7	a) 9.3	a) 16.2	a) 7.3	a) 36.6	a) 26.6
	(6.9)	b) 1.1	b) 1.5	b) 3.0	b) 0.3	b) 1.0
		c) 16.0	c) 22.0	c) 43.0	c) 4.0	c) 14.0
		d) 20.0	d) 19.0	d) 13.0	d) 11.0	d) 38.0
Alberta	a) 9.3	a) 7.4	a) 13.5	a) 7.3	a) 22.7	a) 22.9
	(5.8)	b) 0.8	b) 1.8	b) 1.2	b) -0.7	b) 2.7
		c) 14.0	c) 31.0	c) 21.0	c) -12.0	c) 47.0
		d) 18.0	d) 39.0	d) 10.0	d) -31.0	d) 64.0

Table 6.3

	Crop revenues	Wheat revenues	Barley revenues	Flax revenues	Canola revenues
Manitoba	a) 13.9	a) 19.8	a) 28.6	a) 27.7	a) 44.7
	(14.5)	b) 7.9	b) 2.0	b) 2.8	b) 1.8
		c) 55.0	c) 14.0	c) 19.0	c) 12.0
		d) 21.0	d) 22.0	d) 34.0	d) 23.0
Saskatchewan	a) 16.5	a) 20.7	a) 29.5	a) 31.8	a) 37.3
	(15.9)	b) 15.2	b) 1.1	b) -0.1	b) -0.3
		c) 96.0	c) 7.0	c) -1.0	c) -2.0
		c) 77.0	d) 55.0	d) -21.0	d) -11.0
Alberta	a) 14.6	a) 24.7	a) 15.8	a) 24.6	a) 39.5
	(13.5)	b) 11.4	b) 2.9	b) -0.2	b) -0.6
		c) 84.0	c) 21.0	c) -1.0	c) -4.0
		d) 73.0	d) 49.0	d) -12.0	d) -10.0

Table 6.4

	Cattle revenues	Beef revenues	Calf revenues	Hog revenues
Manitoba	a) 14.8	a) 17.9	a) 21.9	a) 16.5
	(15.0)	b) 9.8	b) 0.6	b) 4.6
		c) 65.0	c) 4.0	c) 31.0
		d) 46.0	d) 16.0	d) 38.0
Saskatchewan	a) 15.0	a) 18.0	a) 25.3	a) 16.8
	(15.2)	b) 11.9	b) 1.2	b) 2.1
		c) 78.0	c) 8.0	c) 14.0
		d) 45.0	d) 28.0	d) 26.0
Alberta	a) 10.5	a) 13.0	a) 23.2	a) 8.5
	(9.6)	b) 7.7	b) 0.6	b) 1.3
		c) 80.0	c) 6.0	c) 13.0
		d) 42.0	d) 42.0	d) 16.0

Table 6.5

	Wheat revenues	Production		Price	Yield	Acreage
Manitoba	a) 26.8	a) 18.7	[18.7]	a) 18.2	a) 12.7	a) 12.3
	(26.9)	b) 11.5		b) 15.4	b) 11.2	b) 7.5
		c) 43.0		c) 57.0	c) 60.0	c) 40.0
Saskatchewan	a) 29.3	a) 23.7	[24.7]	a) 19.1	a) 19.9	a) 10.6
	(29.2)	b) 14.9		b) 14.3	b) 17.8	b) 6.9
		c) 51.0		c) 49.0	c) 72.0	c) 28.0
Alberta	a) 28.9	a) 19.0	[19.0]	a) 19.2	a) 11.8	a) 12.8
	(28.9)	b) 12.8		b) 16.1	b) 9.7	b) 9.3
		c) 44.0		c) 56.0	c) 51.0	c) 49.0

Table 6.6

	Barley revenues	Production		Price	Yield	Acreage
Manitoba	a) 51.6	a) 39.0	[39.0]	a) 20.7	a) 15.3	a) 35.3
	(51.6)	b) 37.1		b) 14.5	b) 5.4	b) 33.6
		c) 72.0		c) 28.0	c) 14.0	c) 86.0
Saskatchewan	a) 34.7	a) 30.2	[30.1]	a) 21.7	a) 18.1	a) 23.6
	(34.6)	b) 20.6		b) 14.0	b) 10.9	b) 19.2
		c) 60.0		c) 40.0	c) 36.0	c) 64.0
Alberta	a) 45.3	a) 29.0	[29.0]	a) 21.9	a) 9.3	a) 24.0
	(45.3)	b) 28.9		b) 16.4	b) 6.1	b) 22.9
		c) 64.0		c) 36.0	c) 21.0	c) 79.0

Table 6.7

	Flax revenues	Production		Price	Yield	Acreage
Manitoba	a) 37.8	a) 34.1	[34.1]	a) 23.4	a) 15.7	a) 29.2
	(37.9)	b) 26.0		b) 11.9	b) 10.2	b) 23.9
		c) 69.0		c) 31.0	c) 30.0	c) 70.0
Saskatchewan	a) 48.5	a) 52.2	[52.2]	a) 23.8	a) 21.3	a) 50.9
	(48.5)	b) 47.1		b) 1.4	b) 2.7	b) 49.5
		c) 97.0		c) 3.0	c) 5.0	c) 95.0
Alberta	a) 50.5	a) 53.6	[53.6]	a) 23.2	a) 11.9	a) 54.0
	(50.5)	b) 49.2		b) 1.3	b) -0.4	b) 54.0
		c) 97.0		c) 3.0	c) -1.0	c) 101.0

Table 6.8

	Canola revenues	Production		Price	Yield	Acreage
Manitoba	a) 41.2	a) 35.7	[35.7]	a) 18.5	a) 11.8	a) 36.3
	(41.2)	b) 31.7		b) 9.5	b) 0.2	b) 35.5
		c) 77.0		c) 23.0	c) 0.6	c) 99.4
Saskatchewan	a) 32.8	a) 35.6	[35.6]	a) 19.4	a) 9.6	a) 40.3
	(32.8)	b) 31.1		b) 1.6	b) -3.9	b) 39.5
		c) 95.0		c) 5.0	c)-11.0	c) 111.0
Alberta	a) 39.2	a) 37.8	[37.7]	a) 19.6	a) 8.6	a) 40.4
	(39.2)	b) 32.8		b) 6.4	b) -2.1	b) 39.8
		c) 84.0		c) 16.0	c) -6.0	c) 106.0

Table 6.9

	Beef revenues	Slaughter	Price
Manitoba	a) 11.3	a) 12.5	a) 11.8
	(11.3)	b) 4.5	b) 6.8
		c) 40.0	c) 60.0
Saskatchewan	a) 16.7	a) 12.6	a) 11.8
	(16.6)	b) 8.6	b) 8.0
		c) 52.0	c) 48.0
Alberta	a) 11.7	a) 13.3	a) 11.8
	(11.7)	b) 6.8	b) 4.9
		c) 58.0	c) 42.0

Table 6.10

	Calf revenues	Slaughter	Price
Manitoba	a) 30.0	a) 35.8	a) 11.6
	(30.0)	b) 34.9	b) -4.9
		c) 116.0	c)-16.0
Saskatchewan	a) 28.4	a) 34.1	a) 11.6
	(28.4)	b) 32.0	b) -3.6
		c) 113.0	c)-13.0
Alberta	a) 43.3	a) 48.6	a) 11.6
	(43.3)	b) 47.8	b) -4.5
		c) 110.0	c)-10.0

Table 6.11

	Hog revenues	Slaughter	Price
Manitoba	a) 12.9	a) 16.8	a) 13.9
	(12.9)	b) 13.3	b) -0.4
		c) 103.0	c) -3.0
Saskatchewan	a) 20.2	a) 22.2	a) 13.9
	(20.2)	b) 20.6	b) -0.4
		c) 102.0	c) -2.0
Alberta	a) 12.3	a) 16.8	a) 13.9
	(12.3)	b) 9.3	b) 3.0
		c) 76.0	c) 24.0

Table 7.1

(1946-82)

	Personal disposable income	Wages	Farm income	Non-farm income	Interest	Transfers
Manitoba	a) 5.4	a) 3.8	a) 32.7	a) 7.5	a) 11.5	a) 11.5
	(4.3)	b) 1.5	b) 2.0	b) -0.3	b) 0.5	b) 0.6
		c) 35.0	c) 47.0	c) -7.0	c) 12.0	c) 14.0
		c) 6.0	d) 68.0	d) -8.0	d) 20.0	d) 15.0
Saskatchewan	a) 11.5	a) 5.7	a) 37.4	a) 6.3	a) 10.1	a) 14.8
	(9.6)	b) 0.8	b) 7.6	b) 0.0	b) 0.5	b) 0.7
		c) 8.0	c) 79.0	c) 0.0	c) 5.0	c) 7.0
		d) 4.0	d) 68.0	d) 0.0	d) 15.0	d) 13.0
Alberta	a) 7.2	a) 4.6	a) 24.0	a) 6.5	a) 10.7	a) 9.6
	(4.4)	b) 1.8	b) 2.2	b) -0.5	b) 0.7	b) 0.2
		c) 41.0	c) 50.0	c) -11.0	c) 16.0	c) 5.0
		d) 10.0	d) 63.0	d) -17.0	d) 35.0	d) 9.0
Canada	a) 3.9	a) 3.6	a) 20.2	a) 9.0	a) 8.0	a) 10.4
	(3.2)	b) 2.1	b) 0.5	b) -0.3	b) 0.1	b) 0.8
		c) 66.0	c) 16.0	c) -9.0	c) 3.0	c) 25.0
		d) 16.0	d) 52.0	d) -15.0	d) 6.0	d) 41.0

Table 7.2

(1961-81)

	Net provincial income at factor cost	Wages	Farm income	Non-farm income	Interest	Profits
Manitoba	a) 3.6	a) 4.6	a) 30.1	a) 5.2	a) 8.2	a) 11.4
11,89	(3.7)	b) 2.4	b) 0.9	b) 0.1	b) -	b) 0.3
		c) 65.0	c) 24.0	c) 3.0	c) 0.0	c) 8.0
		c) 16.0	d) 66.0	d) 6.0	d) 0.0	d) 12.0
Saskatchewan	a) 9.7	a) 4.1	a) 40.1	a) 4.0	a) 12.0	a) 12.0
25,75	(9.7)	b) 1.4	b) 5.8	b) 0.2	b) 1.1	b) 1.2
		c) 14.0	c) 60.0	c) 2.0	c) 11.0	c) 12.0
		d) 5.0	d) 58.0	d) 4.0	d) 16.0	d) -
Alberta	a) 5.8	a) 2.4	a) 21.5	a) 2.5	a) 16.7	a) 10.4
12,88	(5.2)	b) 0.9	b) 0.7	b) -0.1	b) 1.9	b) 1.8
		c) 17.0	c) 13.0	c) -2.0	c) 37.0	c) 35.0
		d) 4.0	d) 31.0	d) -4.0	d) 44.0	d) 24.0
Canada	a) 3.0	a) 3.7	a) 19.4	a) 6.7	a) 5.3	a) 9.0
6,94	(3.3)	b) 2.3	b) 0.2	b) 0.2	b) -0.1	b) 0.7
		c) 70.0	c) 6.0	c) 6.0	c) 3.0	c) 21.0
		d) 17.0	d) 34.0	d) 15.0	d) 9.0	d) 26.0

Table 7.3

Employment Instability
(1966-82)

	Total employment	Farm employment	Non-farm employment
Manitoba	a) 1.4	a) 6.9	a) 1 6
	(1.3)	b) 0.1	b) 1.2
		c) 8.0	c) 92.0
		d) 41.0	d) 59.0
Saskatchewan	a) 2.9	a) 5.6	a) 3.4
	(2.9)	b) 0.5	b) 2.4
		c) 17.0	c) 83.0
		d) 38.0	d) 62.0
Alberta	a) 2.5	a) 6.0	a) 3.0
	(2.4)	b) -	b) 2.4
		c) -	c) 100.0
		d) -	d) 100.0
Canada	a) 1.3	a) 3.3	a) 1.3
	(1.3)	b) 0.1	b) 1.2
		c) 8.0	c) 92.0
		d) 58.0	d) 42.0